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STUDIES ON PINWORM INFECTIONS*

III. TESTS WITH PHENOTHIAZINE IN THE TREATMENT OF PINWORM INFECTIONS

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PHENOTHIAZINE, since its recent introduction as an anthelmintic, has proved to be very efficient against certain species of nematodes parasitic in domesticated animals. Manson-Bahr,¹ who was the first to report on the use of this drug in helminth infections in human beings, found it comparatively ineffective against hookworms, ascaris and whipworms, but reported very favourably on its action against pinworms. Kuitunen-Ekbaum² tested phenothiazine in 89 children and 9 adults infected with pinworms, and found 86 per cent of the children and 8 of the adults were cleared of infection by a single course of treatment.

Neither Manson-Bahr, who gave large doses, nor Kuitunen-Ekbaum, reported untoward effects due to phenothiazine administration. On the other hand, DeEds *et al.*³ using the drug in the treatment of acute urinary tract infections, observed a definite secondary anaemia in three adults who had received 28.1, 19.9 and 23.5 grm. of phenothiazine respectively. The toxicity of the drug has been more extensively studied in domestic animals. This work shows that in certain animals small dosages of the drug produce a definite haemolytic effect, whereas in other animals no adverse effects are produced by ten times the therapeutic dose. Thus sheep will tolerate doses as great as 400 grams, while in certain cases 60 grm. is lethal to horses.

This report presents the results of a study on the efficiency of phenothiazine compared with gentian violet in the treatment of pinworm infections, and the effect of the former drug on the haemoglobin level in the blood of treated children.

A total of 123 children, all male, was treated,

75 with phenothiazine and 48 with gentian violet. The children ranged from 4 to 12 years of age. They were all found positive by the NIH anal swab method, and were examined after treatment by the same method. The gentian violet was administered in tablets with a water-soluble coating. The thickness of this coating was adjusted to keep the tablets from disintegrating until they had reached the vicinity of the caecum. The phenothiazine was the recrystallized product of Merck (99 per cent pure).

The administration of phenothiazine presented a minor problem. Compressed tablets are not satisfactory as they pass through the intestine without disintegrating. Disintegrating tablets and gelatin capsules have the disadvantage of being rather bulky, and children often have difficulty in swallowing them. Giving the drug as a powder sprinkled on cereal, as other workers have done, offers a means of administration, but involves careful supervision. The method finally adopted was to give the drug in chocolate tablets. To prepare these, blocks of semi-sweet chocolate were melted and the powdered drug was stirred in by an electric stirrer (in this case a "Mix-Master"). The mixture was then scooped into a cake decorator syringe and expressed on to squares of wax paper. It was weighed and then left aside to harden. Each tablet contained 1 gram of phenothiazine and either 3 or 4½ grams of chocolate. The 1:4½ mixture was very popular with the children; a few objected to the 1:3 mixture. Assays showed even distribution of the drug in the chocolate.

EXPERIMENT I

Gentian violet was administered to 48 children ranging from 6 to 12 years inclusive. Children 6 to 9 years inclusive received 1 gr. daily for 10 days; those 10 to 12 years inclusive, received 1.5 gr. daily for 10 days. The drug was ad-

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ministered in two 5-day periods separated by a treatment free period of one day.

A second group comprising 50 children was treated with phenothiazine as follows:

| <i>Ages</i> | <i>Dosages</i> |
|--------------------------|--|
| 4 to 6 years inclusive | 6 g., 1 grm. daily for six consecutive days. |
| 7 to 9 years inclusive | 7 g., 1 grm. daily for seven consecutive days. |
| 10 to 12 years inclusive | 8 g., 1 grm. daily for eight consecutive days. |

The first post-treatment swabs were taken four days after the treatment had been completed in the gentian violet group, and two to four days after completion of treatment in the phenothiazine group. These swabs were taken on seven consecutive days for each negative child. When a swab was found to be positive no further examinations of that child were made.

The results of the gentian violet treatment showed the drug to be completely effective in 29 of the 48 children treated, or 60 per cent of the cases. In those children receiving phenothiazine 32 of the 50 treated, or 64 per cent, were cleared of the infection.

EXPERIMENT II

A total of 25 children was treated in this experiment, all eight years of age. The drug used was phenothiazine. With the exception of two children, each received a total of 7 grams. However, instead of 7 one gram doses they were given the drug on three consecutive days in dosages of 2.5, 2.5 and 2 grams respectively. In the two children not receiving the total dose, treatment was discontinued after five grams had been administered.

The 23 children receiving the complete dose of seven grams were found upon post-treatment examination to be completely free of infection. The drug was thus apparently effective in 100 per cent of the cases. The two children who received five grams of phenothiazine were still positive.

THE EFFECT OF PHENOTHIAZINE ON THE HÆMOGLOBIN LEVEL IN THE BLOOD

The hæmoglobin level in the blood of all the children treated with phenothiazine was followed throughout the treatment period and for some time afterwards. Hæmoglobin determinations were made by diluting 20 c.mm. of blood to 5

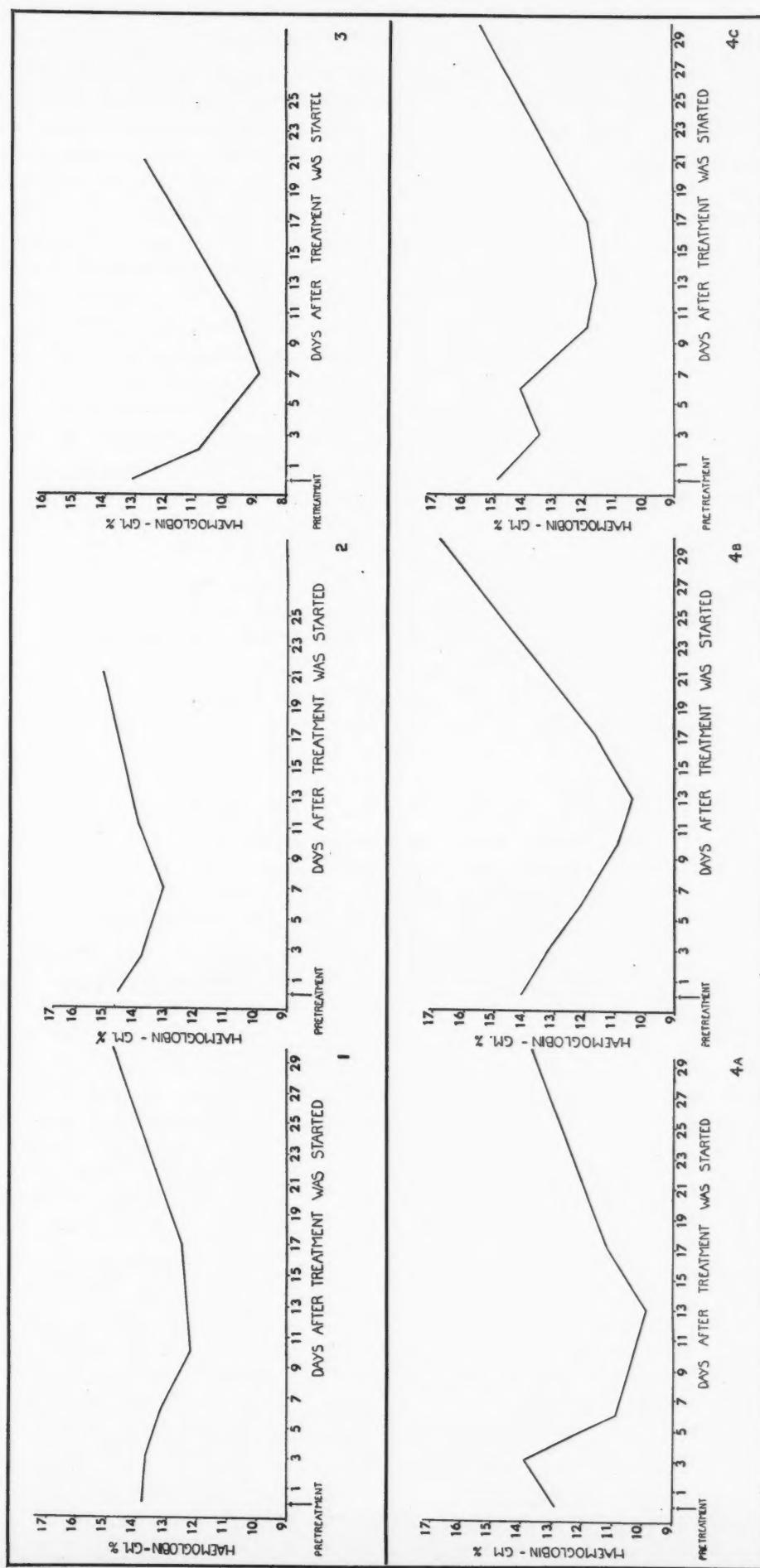
c.c. in N/10 HCl. The solution was read in a Klett-Summerson photoelectric colorimeter against the green filter No. 54.

In Experiment I only a single hæmoglobin determination was made before treatment. Post-treatment values were recorded on the third, sixth, thirteenth, seventeenth and thirtieth days after the beginning of treatment. In a few cases hæmoglobin was also determined on the tenth day. The average of the hæmoglobin levels of the group is graphically represented in Chart 1. A study of this graph will show a drop in hæmoglobin becoming manifest on the sixth day, *i.e.*, after 5 grams of phenothiazine have been given. The downward trend continues, and reaches its lowest level about the thirteenth day, or five to eight days after the complete dose had been given. By the seventeenth day hæmoglobin is starting to regenerate and is back to normal by the thirtieth day.

Three controlled hæmoglobin determinations were carried out in the children treated with phenothiazine in Experiment II. These were averaged for normal hæmoglobin values. Further determinations were made on the second, seventh, eleventh and twenty-first day after the beginning of treatment. The average hæmoglobin levels for the whole group during this period is graphically represented in Chart 2. The hæmoglobin level starts dropping rather quickly to reach its lowest level on the seventh day. By the twenty-first day it is back to normal.

A study of the individual hæmoglobin curves brings several interesting facts to view. In the first place it is seen that phenothiazine does not induce a reduction of blood hæmoglobin in every child. In those children who show an anæmia as a result of the drug, some show a much greater response than others. In Experiment I about half of the children show a drop of two grams or more in the hæmoglobin level of the blood. Of the remaining half, at least half show no evidence of anæmia, and the rest a drop in blood hæmoglobin of less than two grams, an amount that is probably not significant. In Experiment II about one-third of the children show a drop in the hæmoglobin level of two grams or more. Another third show no evidence of induced anæmia and the remaining third a slight drop.

However, it should be pointed out that in those children showing a definite anæmia, the



Charts 1 and 2.—Average haemoglobin level in children treated with phenothiazine in Experiments I and II respectively. Chart 3.—Haemoglobin curve obtained from a child "B," aged 8 years treated with phenothiazine in Experiment II. Chart 4.—Haemoglobin curves obtained in

Experiment I showing transient anaemia as a result of treatment with phenothiazine. 4A. From a child "N," aged 6 years treated with 6 g. 4B. From a child "C," aged 7 years treated with 7 g. 4C. From a child "G," aged 8 years treated with 7 g.

haemoglobin curves are similar to those calculated for the groups as a whole (see Charts 1 and 2). Charts 3 and 4 show typical examples of the haemoglobin picture in those children in whom phenothiazine administration induced a definite drop in the haemoglobin level of the blood.

The greatest drop in haemoglobin level recorded in Experiment I was 29 per cent and in Experiment II 32 per cent, drops of 3.8 and 4.2 grm. of haemoglobin respectively.

No untoward effects other than the transient anaemia were noted in any children in Experiment I. In Experiment II, however, drug administration had to be discontinued in two children after five grams had been given. The drug was given on two consecutive days. On the morning of the third day, upon arising, they complained of abdominal cramps and of feeling very weak. Their pulse was small, rapid and irregular; pulse rates were 160 and 140 respectively. They were markedly pale. Both children were confined to bed, and in the case of D. the pulse rate, which was 160, remained at that level all through the day and fluctuated between 120 and 140 for the next two days before returning to normal. In the case of G. the pulse rate returned to normal by the late afternoon of the same day. D. was later shown to be suffering from a heart condition. Curiously enough, there was no significant drop in the haemoglobin level in the blood of either child.

It should be stated at this point that no untoward symptoms of any sort were observed in the children receiving gentian violet treatment.

DISCUSSION

In Experiment I phenothiazine, when administered in doses of six to eight grams over a period of as many days was effective in removing all pinworms in 64 per cent of the children. On the other hand in Experiment II the same dose given in half the time was effective in 100 per cent of the cases. It should be pointed out that in Experiment II the first post-treatment swabs were taken four days after treatment had been completed. At this time six children were still harbouring pinworms as shown by the positive swabs. Of these one remained positive for three days and one for four. However, the swabbing was continued in all children and seven additional swabs were found negative in all cases. It is therefore, necessary to wait at least eight days after the treatment has been com-

pleted before starting to take post-treatment swabs. In Experiment I the first post-treatment swabs were taken 2 to 4 days after the end of the phenothiazine treatment and four days after the end of the gentian violet treatment. This factor may explain the lower efficiency of both drugs in this experiment, as a child with one positive swab was considered to be still harbouring the worms. Had we started taking the post-treatment swabs later both drugs would probably have been found more effective. Previously, Miller *et al.*⁶ had found that in the doses used in the present experiment gentian violet was 90 per cent effective. The reduced efficiency in Experiment I is probably due to the fact that post-treatment swabs were taken too soon, as well as to the more intense infection in the present institutionalized group.

Because of taking the post-treatment swabs too soon, it is difficult to evaluate the comparative efficiency of phenothiazine and gentian violet in Experiment I. However, our work indicates that phenothiazine has an anthelmintic efficiency against egg-laying pinworms probably greater than gentian violet.

Phenothiazine as administered in Experiment I is not effective in all cases. In spite of the difficulty in evaluating the results, this fact is revealed in studying the order of recovery of the positive swabs. This would suggest that the administration of the drug over a shorter period of time, as was done in Experiment II enhances its efficiency. According to Swales⁷ there is a direct correlation between the amount of phenothiazine reaching the part of the bowel inhabited by the worms and the efficiency of its anthelmintic action in sheep. This may prove to be the case in humans as well. Because of its rapid absorption from the upper part of the intestinal tract⁸ it is necessary to administer the drug in large doses (*e.g.*, as in Experiment II) to assure its greater concentration in the region of the caecum where the pinworms are normally located. This might explain the increased efficiency of the phenothiazine in Experiment II.

The results of the studies on the blood haemoglobin levels during and following phenothiazine administration demonstrates that this drug does produce a transient anaemia in at least half of the children treated. In most cases the drop in the haemoglobin level is not very marked and in all cases there is a recovery back to normal within three to four weeks. In several instances where the haemoglobin dropped 25 or 30 per

cent the children appeared rather pale and languid and were confined to bed. However, it should be pointed out that in all these cases the children were sickly before treatment, being normally under weight and pale, with a rather low haemoglobin level. On the other hand, some children showed a rather marked drop in haemoglobin from an originally high value with no apparent ill effects.

A comparison of the haemoglobin curves in Experiments I and II (Charts 1 and 2) shows them to be quite similar. Both show a drop in the haemoglobin which does not reach its lowest point until several days after treatment has been completed. In both the average drop is about the same, being 1.6 grams as compared with 1.5 grams, and in both there is a recovery back to normal and even higher within a comparatively short time. There is one important difference, however; in Experiment II the lowest point in the curve is reached much sooner than in Experiment I—on the seventh day after starting treatment as compared with the thirteenth day. Also, recovery to normal occurs much sooner, taking place on the twenty-first day in Experiment II as compared with the thirtieth day in Experiment I. This, perhaps, is to be expected, because in Experiment II the drug was given over a shorter period of time and might, accordingly, produce its haemolytic effects sooner.

The symptoms exhibited by the two children in Experiment II after the administration of five grams of phenothiazine is of considerable interest. It appears probable that the symptoms were brought on by the drug, but were apparently not due to a reduction in haemoglobin. What caused the symptoms cannot be stated at this time, although a cardiac defect in the one child may have been a predisposing factor.

SUMMARY AND CONCLUSIONS

1. Phenothiazine, administered in chocolate tablets, was tested in 75 children infected with pinworms.

2. Fifty children, aged from 4 to 12 years, were given 6 to 8 grams of phenothiazine over a period of as many days. Post-treatment swabs showed the drug to be effective in 64 per cent of the children. In a similar group of 48 children, gentian violet was found to be completely effective in 60 per cent of the cases. As discussed above, these findings for both drugs are probably lower than their actual efficiency.

3. Twenty-three infected children, eight years of age, were given seven grams of phenothiazine over a period of three consecutive days. Post-treatment examination showed the drug to be effective in each case. The two children in whom drug administration was discontinued after the second day were still positive.

4. Phenothiazine is probably more efficient in the treatment of pinworms than gentian violet.

5. Phenothiazine produced a definite, but in most cases slight, anaemia, in at least half of the children treated.

6. This anaemia was transient in nature, the haemoglobin reaching its lowest level from four to seven days after the completion of treatment, and returning to normal in three to four weeks.

7. Phenothiazine administered over a shorter period of time without decreasing the dosage, is apparently more effective in the removal of pinworms, than in a longer treatment period. There is some evidence that the drug may be more toxic when administered in this manner.

8. While phenothiazine appears to be exceedingly efficient in the treatment of pinworms, further studies on the haemolytic and possible toxic properties of this drug are indicated before it can freely be recommended for anthelmintic use in children.

We wish to express our appreciation to Rev. Ovila Fournier of the Department of Zoology, Université de Montréal, for assistance in helping to organize the experiment, as well as to those in charge of the orphanage of Notre Dame de Liesse, Montreal. We thank Miss Celia Ferguson of the School of Household Science, Macdonald College, for assistance in preparing the chocolate-phenothiazine tablets. Especially do we wish to thank Sister Guimond for her invaluable assistance throughout the course of the work.

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CRUSH SYNDROME

BY H. R. ROBERTSON, CAPTAIN, R.C.A.M.C. AND W. H. MATHEWS, MAJOR, R.C.A.M.C.

ATTENTION has been drawn recently^{1, 2, 3, 4} to a condition characterized by a suppression of renal function following a crushing injury resulting in muscle damage. Details of a sufficient number of cases exhibiting a typical clinical picture and constant laboratory and pathological findings have been obtained to warrant the recognition of a distinct entity to which the name "crush syndrome" has been applied.

The following case is typical.

CASE REPORT

H.B., male, 36 years, was trapped in a small room on the ground floor of a house and crushed by debris

for approximately six hours. More complete details are not available. He was admitted to a hospital where examination revealed "shock". He complained of his left leg being "dead". He was given morphine grains 1/3 and A.T.S. units 3,000. He improved sufficiently to be considered fit for transfer to an R.C.A.M.C. hospital (a distance of ten miles) about twelve hours following the injury.

Examination showed the patient conscious, cold, cyanosed, sweating, thirsty and complaining bitterly of pain in the back (level of twelfth dorsal to second lumbar spines) radiating to the front of the abdomen and down both legs. There was marked tenderness all over the back. The patient could not move his legs and there was apparently loss of sensation to pin-prick in the right leg. There were no superficial abrasions. There was an oedema of the left thigh extending up into the left loin.

| Time | Pulse | Blood pressure | Respirations | Observations |
|--|-----------------------|--------------------------|--------------|--|
| Admission 3.10 p.m. April 11, 1941 | 132 Thready | Unobtainable | 32 | Temperature 96.3°. Foot of bed raised. Heat cradle applied, fluids by mouth given. Vomited 300 c.c. dark brown fluid. |
| 3.20 p.m. | 130 | 0 | 32 | Venous blood haemoglobin 148 per cent (21.4 g.). Haematoctit 54 per cent. White blood cells 23,700. Plasma drip (200 drops per minute) started. |
| 3.45 p.m. | 120 | 0 | 24 | Still cyanosed. Complaining of pain and thirst. 540 c.c. plasma given. Second bottle started. |
| 4.10 p.m. | 120 | | | Second bottle complete. Third bottle started. No apparent response to therapy so far apart from decrease in pulse rate. Oxygen (B.L.B. mask 6 litres per minute) started. |
| 4.20 p.m. | 120 Volume greater | 110/85 | 38 | First blood pressure recorded was over 100. Venous blood observations: haemoglobin 103 per cent (15 g.). Haematoctit 45 per cent. White blood cells 8,450, red blood cells 5,160,000. Third bottle of plasma finished. Plasma discontinued for time being. Oxygen continued. |
| 4.45 p.m. 5.30 p.m. | 60 152 | 128/80 118/82 | 14 | No cyanosis. Feels much better. Oxygen discontinued at 5.00 p.m. Peripheral blood observation: specific gravity 1.0616. Venous blood observation: haematoctit 43 per cent, white blood cells 14,000. |
| 6.10 p.m. 6.45 p.m. 8.20 p.m. | 156 144 150 | 112/82 94/74 92/72 | 36 | Colour good, sweating profusely. Given morphine grains 1/6 for pain. Slightly cyanosed. Venous blood observation: haematoctit 48 per cent. Plasma restarted (4th bottle). |
| 8.50 p.m. 9.13 p.m. | 150 150 | | | No apparent improvement. Oxygen restarted. Fourth bottle of plasma completed. Colour improved. Fifth bottle of plasma started. |
| 9.30 p.m. 10.00 p.m. April 12th | 118 118 | 120/82 122/78 | 32 | Colour much improved. Plasma discontinued after 400 c.c. of fifth bottle given. |
| 5.30 p.m. 10.00 p.m. April 13th | | 110/76 104/80 | | Vomited 500 c.c. X-ray of spine, pelvis and upper femora negative. Learned from relatives that past medical history is negative except for pneumonia in childhood. |
| 4.00 a.m. | 100 | 102/76 | 32 | Nauseated. Owing to poor fluid intake during the day, given 1,080 c.c. iso-tonic glucose saline intravenously. |
| 11.30 a.m. | 100 | 130/100 | | Complaining of thirst and nausea. Taking sips of fluid. Has not voided and there is no bladder tumour. Venous blood observation: haematoctit 40 per cent. |
| 5.00 p.m. | | | | Continuous gastric suction set up in an attempt to control the nausea which has persisted throughout the day. Continuous glucose saline drip set up. |
| 10.00 p.m. April 14th | | | | Catheterized. 210 c.c. urine obtained. (See summary.) |
| 8.30 a.m. | 76 | 142/90 | 22 | Rational. Occasional twitching of face muscles. Colour good. During night received 3,240 c.c. iso-tonic glucose saline. Gastric suction discontinued. |
| 12.00 noon | 80 | | | Edema of left thigh is now very evident. Circumference of thighs 20 cm. below anterior superior iliac spine shows: right 44 cm., left 50 cm. No edema of the legs and their measurements are equal. Legs can now be moved but this causes pain in the back. Abdomen distended and tympanic. No rigidity, no tenderness and no dullness in flanks. Heart and lungs normal. Soap suds enema this morning was ineffectual. Patient still has not voided since catheterization last night. |

| Time | Pulse | Blood pressure | Respirations | Observations |
|-------------------------|-------|----------------|--------------|---|
| 7.45 p.m. April 15th | | | | Plasma drip started. Shortly afterwards, patient vomited (projectile) about 300 c.c. |
| 9.00 a.m. | | | | During the night received 1,080 c.c. plasma and 2,160 c.c. iso-tonic glucose saline intravenously. Measurements of thigh at same level show right 44 cm., left 51.7 cm. Both arms swollen (infiltration from intravenous). Catheterized, 200 c.c. urine obtained. Twitching of face continues. Apical systolic murmur noted. During the day, patient received intravenously 300 c.c. 20 per cent glucose in distilled water and 1,500 c.c. 5 per cent glucose in distilled water. Venous blood observation: (before above intravenous therapy) haematoцит 33 per cent. Blood urea nitrogen 140 mg. per 100 c.c. During the day, patient vomited small amounts from time to time. Conscious and rational but apprehensive. |
| April 16th 9.00 a.m. | 88 | 144/88 | 20 | Temperature 98.3/5° F. No improvement in general condition. Skin moist, pitting oedema of back and oedema of left thigh is increasing. Chest negative except for apical systolic murmur. Abdomen negative. Fundi show no exudate and no haemorrhage. 150 c.c. 20 per cent glucose in distilled water given rectally. Catheterized, 90 c.c. urine obtained. |
| April 17th 9.00 a.m. | 80 | 155/82 | 22 | Oedema of legs and back persists—if anything, slightly increased. Fundi negative. Blood urea nitrogen 220 mg. per 100 c.c. Catheterized, 75 c.c. urine obtained. Patient rational and conscious but drowsy. Condition remained the same throughout the day. Given 150 c.c. 20 per cent glucose rectally every four hours. |
| April 18th 2.30 a.m. | | | | Patient died suddenly without any apparent change in his condition shortly prior to his death. |

SUMMARY OF URINARY FINDINGS

| Date | Reaction | Volume | Specific gravity | Albumen | Sugar | White blood cells | Red blood cells | Casts | Benzidrine |
|----------------|----------|----------|------------------|---------|--------|-------------------|-----------------|-----------|------------|
| April 13, 1941 | acid | 210 c.c. | 1.016 | 2 plus | trace | 1/H.P.F. | 0 | granular | 4 plus |
| April 15, 1941 | acid | 200 c.c. | 1.014 | 3 plus | 1 plus | 3/H.P.F. | 0 | 10/H.P.F. | 0 |
| April 16, 1941 | acid | 90 c.c. | 1.014 | 3 plus | trace | 100/H.P.F. | 0 | granular | 2 plus |
| April 17, 1941 | acid | 75 c.c. | 1.014 | 2 plus | 0 | 30/H.P.F. | 0 | 2/H.P.F. | 0 |

Necropsy.—The main findings were as follows. In the thoracic cavity, there is a small amount of bloody fluid in each pleural cavity. The pericardial sac is normal and contains a small amount of pale fluid. The heart is not enlarged and is moderately dilated. The pericardium, myocardium and endocardium and the valves are intact.

Both lungs are voluminous and poorly crepitant throughout. On section, they are dark purplish red in colour and a large amount of frothy, bloody fluid escapes from the surface and from the bronchioles. The vessels are free of thrombus.

The intestinal tract throughout shows no abnormality.

The right perirenal tissues are oedematous and in them around the hilus and its vessels there is a small area of haemorrhage into the tissues. The right renal vein and suprarenal vein are markedly dilated and engorged with fluid blood. The left renal vessels are not dilated.

On section, both kidneys are mildly engorged with blood but otherwise appear normal. Their capsules strip with ease. There is a small amount of thin, yellow pus in the left pelvis. The ureters are intact.

The bladder is contracted and, on being opened, is empty of urine but its mucosa is coated with thin, yellow pus and is congested.

In the supradiaphragmatic portion of the inferior vena cava, a structure resembling antemortem thrombus was seen but this unfortunately was lost during isolation of the remainder of this vessel. Throughout the remainder of its course, below the diaphragm, it contains only fluid blood and the intima is intact. The same is true of its tributary vessels in the thigh.

When the left femoral region is incised, oedema fluid pours from the tissues but these reveal no evidence of contusion or other injury. No fracture is detected.

There is no fracture of the vertebral column nor of the ribs but there is old haemorrhage into the intercostal tissues in their posterior portions. This is considerably more pronounced on the left side.

Microscopic (positive findings only).—Lungs: Sections of all lobes reveal a marked dilatation and engorgement with blood of the larger vessels of the lungs, as well as of the alveolar capillaries. Very few alveoli are aerated, most of them containing a granular, eosinophilic material in which a few red blood cells and macrophages are present. There is no inflammatory reaction and the bronchioles contain a material similar to that within the alveolar spaces. In one section, there is a small, subpleural focus of fibrous scarring in which there are cystic spaces, the remains of dilated alveoli or bronchioles. There is mild anthracosis of this tissue and a few foci of lymphocytes but no tuberculous granulation tissue.

Liver: The general architecture is well preserved except for dilatation and engorgement of the vessels, which are quite marked in the central lobular veins. With this, there is mild parenchymal atrophy adjacent to the central veins.

Spleen: The pulp is quite engorged and congested, in some areas being hemorrhagic, whereas in others there is a mild reticular hyperplasia with an increased number of polymorphonuclear cells. The lymphoid follicles are small and not at all prominent.

Bladder: The vessels beneath the mucosa are markedly dilated and engorged and there is a mild infiltration of the mucosa by polymorphonuclear leucocytes and lymphocytes.

Kidneys: Sections from both kidneys are identical. The general architecture is well preserved.

There is a moderate vascular engorgement, although most of the glomerular capillaries are not dilated or

engorged, this feature being present to a mild degree in a small number. The glomeruli themselves are intact except that an occasional one contains within Bowman's space a small amount of pale, eosinophilic, granular material. The convoluted tubules are well preserved but in the majority of these there is a similar granular material occupying their lumina.

The striking feature of all the sections is the presence within the lumina of many collecting tubules of a dense, brownish red, granular material, resembling blood pigment. An occasional tubule contains an hyaline cast and the epithelium of many of the collecting tubules contains within its cytoplasm a similar granular pigment to that seen in the lumina. For the most part, this epithelium is well preserved and only in some tubules is it degenerated and in some instances shed cells mingle with the pigment casts. Unaltered blood is seen in the tubules only very rarely.

Iron stains (Berlin Blue) reveal that the pigment casts contain no free iron.

Final diagnosis.—(1) Iron-free pigment casts in the renal collecting tubules. (2) Chronic pyelonephritis, mild, with acute cystitis, mild. (3) Haemorrhage and oedema of the right peri-renal tissues with marked dilatation of the right renal and suprarenal veins. (4) Haemorrhage into the posterior intercostal tissues most pronounced on the left side. (5) Bilateral hemothorax, slight. (6) Bilateral pulmonary congestion and oedema, marked.

DISCUSSION

The history and clinical course of this case correspond closely with those of the other reported cases. All have sustained a crushing injury. The usual story is that their legs or arms have been pinned down by fallen masonry. The duration of the crushing varies greatly and there does not appear to be any direct relationship between the duration and the subsequent seriousness of the condition. The shortest period recorded of crushing which has been followed by the development of the "crush syndrome" is three hours and the longest twenty-six hours. The average period is about ten hours. Both sexes have been affected and the age range is from 11 to 51 years.

Physical examination at the outset reveals, in addition to the evidences of shock, tenderness, oedema, and sometimes bruising over the affected parts. There may be whealing of the skin and, if this is not present early, it frequently develops later on. The involved limbs are often partially or completely paralyzed and sensation is usually diminished or absent. Arterial pulsation may be reduced and, in several cases in which the oedema has progressed, pulsation has disappeared entirely. There may or may not be associated fractures.

The initial shock is apparently controlled by ordinary measures such as bed rest, heat and morphia. Later on (in some instances within a few hours, in others after two or three days), shock reappears and is evidenced by pallor or cyanosis, cold sweating extremities, rapid pulse,

subnormal temperature, low blood pressure, leucocytosis and, in almost every case, by a marked haemo-concentration. This episode is controlled by more vigorous measures such as the administration of oxygen and intravenous fluids.

During the course of the next few days, shock does not recur but the patient remains ill. He is drowsy, apprehensive and vomits frequently. The tongue is dry and coated and the breath foul. The blood pressure tends to increase daily. The urinary output is very low and the blood urea and blood potassium high. The carbon dioxide combining power of the blood drops. Oedema increases and, particularly if fluid is forced, the blood becomes more and more dilute.

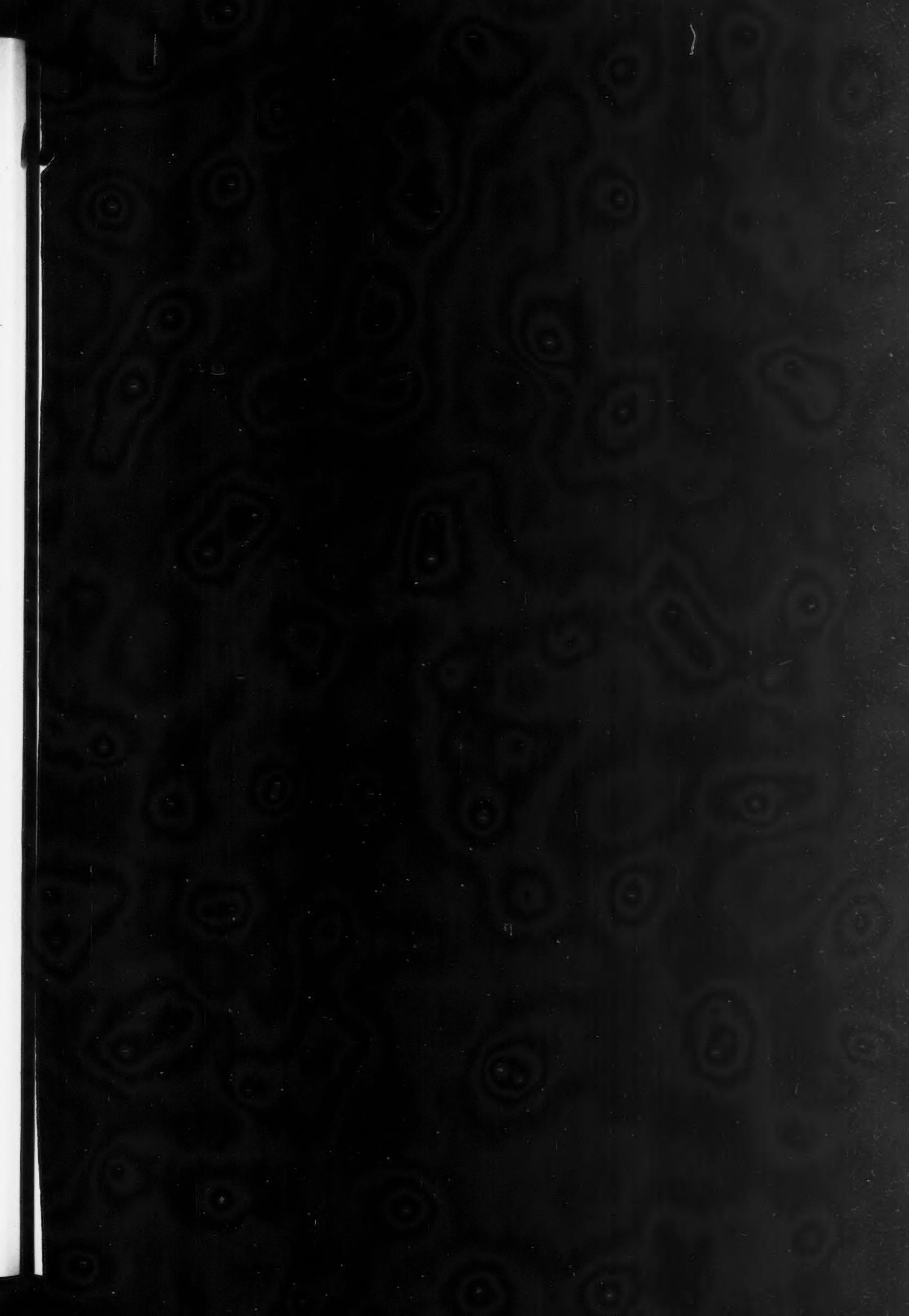
Other clinical features that have been noted are muscular twitchings and an intermittent apical systolic murmur. This latter has been noted in three cases and its significance is not determined. In the case described above, it was thought at first to be a pericardial friction rub but at autopsy no pericarditis was found. No changes in the ocular fundi have been recorded.

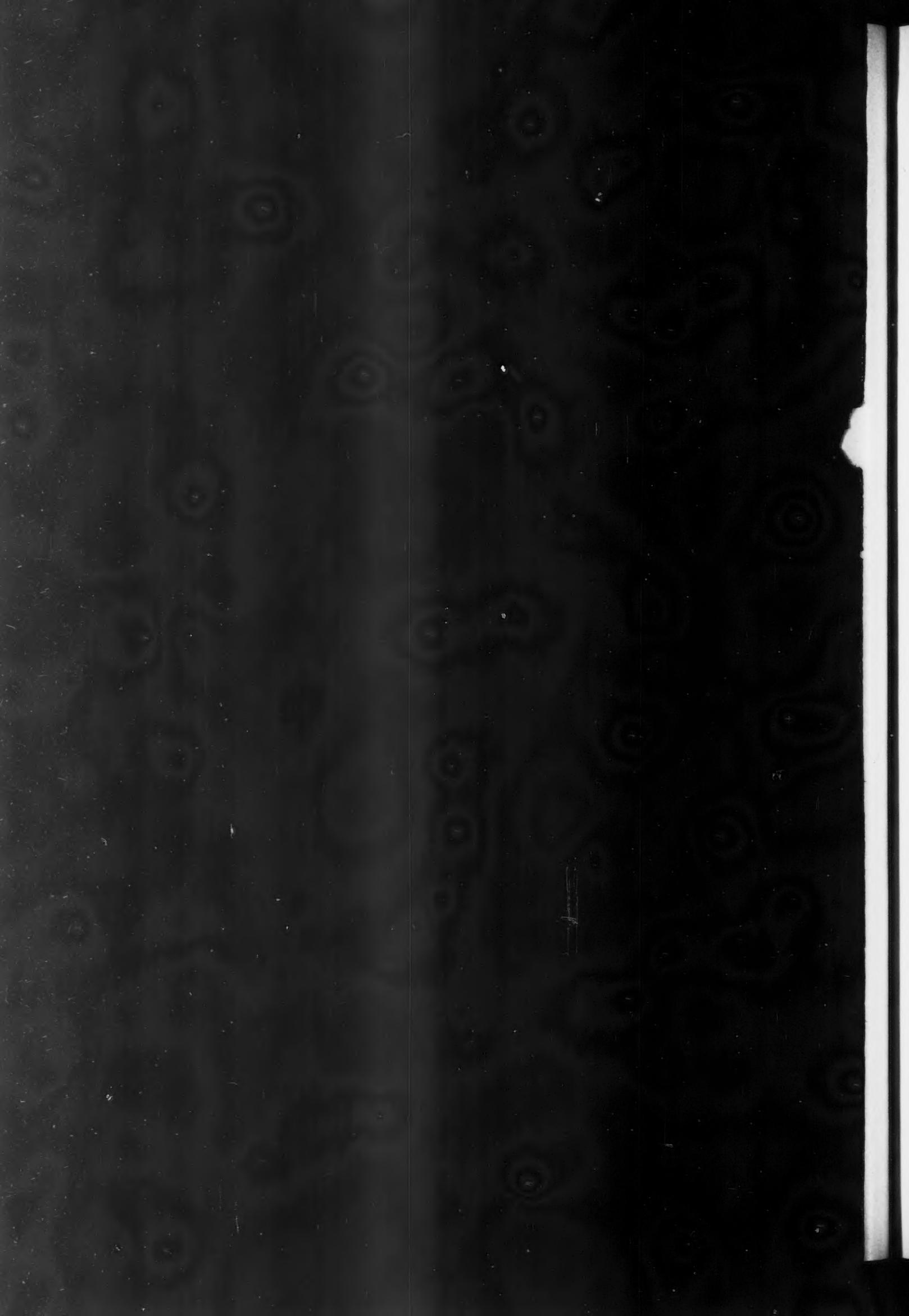
Recovery is heralded by an increase in urinary output with a corresponding decrease in the oedema and lowering of the blood urea and potassium values. The blood pressure declines as recovery progresses. As a rule, if the patient survives, the affected limb returns to normal but that this is not invariably so is illustrated by the case described by Blackburn and Kay¹⁴ in which amputation was eventually performed because of paralysis, pain, intractable ulceration and the patient's poor general condition.

Death, when it occurs, comes rather suddenly somewhere between the seventh and the tenth day. The mortality of the condition is difficult to assess at the present time. Undoubtedly many cases, both mild and severe, escape notice. A study of the reported cases reveals that, of those in whom the syndrome was fully developed, few survived.

PATHOLOGY

The findings at post mortem in cases of "crush syndrome" are quite distinctive and centre in two sites, *viz.*, the kidneys and skeletal muscle. As first reported by Bywaters and Beall,¹ the kidneys macroscopically reveal only congestion and oedema but show well marked microscopic changes which centre chiefly in the renal tubule. The glomeruli show no histological alteration





but do reveal the presence of an albuminous material in Bowmann's space. The epithelium of the convoluted tubules and loops of Henle shows some degenerative changes and may be shed, mingling within the tubules with eosinophilic coagulum. The striking finding is of pigment casts which may be present in the loops of Henle but more abundantly in the collecting tubules.

These casts are composed of a granular material and have a greenish brown colour suggesting blood pigment which mingles with the shed epithelium or other detritus and which come to have a leucocytic content as the terminal tubules are reached. No fatty changes are present and the granular casts do not give a histochemical reaction for inorganic iron. The damaged skeletal muscle is pale and may show some degree of haemorrhage into it and microscopically it reveals necrosis. Unfortunately, in the above case, the muscles of the back and gluteal region were not examined.

In the case of Blackburn and Kay,¹⁴ in which the crushed limb was amputated 15 weeks after injury, section showed a multiplication of muscle nuclei and young fibrous tissue. The sciatic nerve showed interstitial fibrosis and slight lymphocytic infiltration together with slight scarring of individual nerve bundles. The arteries of the limb showed medial degeneration with calcification and an associated atherosclerosis. The veins were normal.

URINARY FINDINGS

The urinary findings are well illustrated in the above case. The volume is low. The specific gravity is fixed at about 1.015. The urine is acid. Albumen is invariably present. White blood cells are a common finding. The large number in this case may be accounted for by the repeated catheterization. Red blood cells have been found in several cases but are not always present. Granular, pigmented casts are found in every typical case. In association with these, a positive benzidine reaction is almost always present.

TREATMENT

The shock exhibited in these cases is treated by the usual methods. The real problem concerns the treatment of the later developing oliguria. Diuretics (such as hypertonic glucose, caffeine, mercury, etc.) have been used without effect. Large amounts of fluid have been given in every case and usually the only observed

result was an increase in the oedema. Hot packs in the kidney region are of no apparent benefit.

Various surgical procedures have been suggested. These include amputation (performed in one case without success¹), incision through the deep fascia in an attempt to re-establish circulation cut off by oedema, and decapsulation of the kidneys. The use of elastoplast on the oedematous limb has been suggested.¹⁵ Trueta¹⁷ has had experience with crushing injuries. He advises the application of skin tight plaster in those cases in which the general circulation of the limb (as shown by oscillometric readings) and the peripheral vascular circulation are adequate to prevent a complete ischaemia. If, he states, the oscillometric reading is negative in the injured limb, immediate amputation is called for.

Recently several cases of recovery have been reported^{7, 14, 18} and in these the success was attributed to the administration of alkalis. The rationale of alkali therapy is based on two facts: (1) these patients all show a marked acidosis and (2) it is probable that, like haemoglobin, the pigment found in these cases is precipitated in the tubules, if the urine is acid, while, if the urine is alkaline, the pigment will pass through without renal injury.

Longland and Murray¹⁸ administered 360 grains of potassium citrate by mouth daily for four days and 480 c.c. of 3.3 per cent sodium sulphate intravenously on the third of these days before rendering the urine alkaline. Henderson⁷ gave 540 c.c. of 3.3 per cent sodium sulphate intravenously daily for four days. Blackburn and Kay¹⁴ gave 1,000 c.c. of 2 per cent sodium bicarbonate rectally on the fifth day after injury and later (on the eighth day) started sodium bicarbonate orally, giving a total of 96 grams in seven days.

At the present time, it would appear that the administration of alkali in sufficient doses to alkalinize the urine is of prime importance in the treatment of these cases. Presumably the earlier it is started the more likely will it be to benefit.

ETIOLOGY

Although a similar condition has been described in the German literature on a few occasions,⁵ it has not, so far as can be ascertained, been recognized elsewhere. At the same time, it is obvious that the crushing injury is by no means a novelty, it being a fairly common event

in industry, particularly in mining. It is therefore surprising that more cases have not been reported. It might be contended that such cases have not occurred before and that their appearance now is due to the introduction of new therapeutic measures. Of these, only the administration of blood, or one of its derivatives, might reasonably come under suspicion. Whilst there is an apparent similarity between the "crush syndrome" and the reaction to an incompatible transfusion there is a considerable body of evidence indicating that incompatible transfusion is not the cause of the renal damage in these cases.

The points may be enumerated as follows.

1. In at least two reported cases,^{7, 14} the typical syndrome developed when no transfusion of any kind had been given. In another,³ the syndrome was fully developed before any transfusion was given.

2. Only a few cases have received whole blood, the majority having been given plasma or serum. These blood derivatives should, owing to the method by which they are prepared, be free from agglutinins. It is highly significant that plasma and serum have been administered to hundreds of cases of other types of injuries without a single reported instance of renal damage.

3. In the cases in which the syndrome developed following the administration of plasma or serum, there was rarely any clinical evidence of reaction such as chill or back pains, so commonly seen in incompatible transfusions.

Furthermore, there is evidence suggesting that there might well be some other explanation for the development of the renal changes in the "crush syndrome".

4. Renal changes, as seen in the transfusion kidneys, have not, even in the past, been recognized as peculiar to transfusion kidneys. Bratton⁸ reports nine cases exhibiting pigment and red blood cell casts and tubular degeneration. In these, no transfusion had been given.

5. It has been shown experimentally⁹ that when a tourniquet which has been applied tightly to the limb of a dog is released, there follows a decrease in the carbon dioxide combining power of the blood and a fall in the urinary output. Bieter¹⁰ demonstrated a reduction in the number of functioning glomeruli in the living frog's kidney following the release of a tourniquet. Miller,¹¹ following up this work, observed that "In the glomeruli whose activity had been arrested by the release of a tourniquet, the capillary loops were distended with red cells, unlike the normal functional intermittency exhibited by the glomeruli of the frog's kidney, in which the capillaries are constricted and contain only a few red cells". He also states, "If the animal was excreting a dye, such as phenol red, when the reduction of functioning glomeruli occurred, it was seen to become concentrated in the distal convoluted tubules, appearing as red streaks. It was usually impossible to attach a tubule to any particular glomerulus, but with the return of the circulation the dye was seen to be washed out. The concentration was very high in the distal tubule during the period of stasis, due both to the absorption of water and the secretion of the dye, so that any toxic substance present would probably reach a fairly lethal concentration capable of damaging the tubular epithelium." These observations are sufficient to establish a definite association between a disturbance of peripheral circulation and an impairment of renal function.

6. Gilmour¹² points out the similarities that exist between the "crush syndrome" and equine paralytic myoglobinuria, in which condition myoglobin is passed in

the urine and at necropsy the muscles show degeneration and necrosis of the fibres and the kidneys contain casts of the pigment. He proposes a "myoglobinuria theory" for the "crush syndrome".

Bywaters and Delory¹³ report the demonstration of a pigment in the urine of two cases of "crush syndrome". This pigment, present both in the casts and in solution, has the spectroscopic characteristic of oxymyohaemoglobin.

After a consideration of these facts, one is tempted to theorize along the following line.

During the period of crushing, circulation in the affected parts is diminished and muscle is damaged either directly, by crushing, or indirectly by deprivation of circulation. Following release from the crushing, myohaemoglobin is set free and is carried to the kidneys. Here glomerular activity is reduced and flow in the tubules is diminished. Myohaemoglobin is concentrated in these tubules and casts are formed. Whether the subsequent renal changes and the further reduction of urinary output are due to mechanical obstruction of these tubules by the casts or whether they are due to the irritative effects of myohaemoglobin upon the renal parenchyma are questions not settled.

There is no direct experimental evidence to support such a theory. It might well be that the initial lesion is a tubular degeneration due to the absorption of some nephrotoxic substance from the damaged area. In any event, it would appear from the available data that the renal changes observed in the "crush syndrome" bear a direct relationship to the muscle damage and are not the result of misguided therapy.

SUMMARY

A case of "crush syndrome" is reported and the clinical, laboratory, pathological and therapeutic features are discussed. Etiological possibilities are briefly reviewed.

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THE INEFFICACY OF SULFAPYRIDINE IN INFLUENZA*

BY J. D. ADAMSON AND R. O. FLETT

Winnipeg

MUCH interest is now centred in the treatment of influenza. If this epidemic follows the general pattern of most others, we must expect a second and perhaps a third wave of cases; such secondary waves are usually less wide spread than the original but are more virulent and carry more complications. Before this is upon us it is well to consider the best means of treatment.

There is a common impression that sulfapyridine or sulfathiazole are of definite benefit. For any one who treats occasional cases and gives one of the drugs to all of them, such an impression is inevitable. The patient usually consults his physician on the second day of his illness, the drug is immediately given, and on the third or fourth day the temperature is normal. In the present epidemic there were but few exceptions to this course. But the sequence of events in untreated cases is not dissimilar and the exact effect of drug therapy can only be judged by comparing an untreated and a treated group. The result of such a comparison is herewith submitted.

Material.—Sixty-eight cases were treated, 42 with sulfapyridine and 26 without. They were all from the active service forces and admitted to the Department of Pensions and National Health hospital at Deer Lodge, Winnipeg. The cases all arose during a period of nine days (December 1 to December 9, 1940), and 75 per cent arose during a period of four days (December 4th to December 7th). Full bed care and treatment was started on the first day in 6 cases; on the second day in 30 cases, and on the third day in the remaining 32 cases.

DIAGNOSTIC CRITERIA

The term "influenza" is commonly used very loosely to include a multitude of minor febrile disturbances of obscure origin, usually associated with respiratory or gastro-intestinal symptoms. It is true that during non-epidemic periods isolated cases with bizarre clinical features must frequently be classed as in-

fluenza; but during epidemics there is no infectious fever that conforms so closely to a common pattern. In each epidemic the subjective symptoms and the course are almost identical in all cases occurring at or about the same time.

In an epidemic the chief confusion arises in differentiation from acute upper respiratory infection. If these two co-exist or if one follows the other (a common event), the difficulty is increased; the fact that each may be followed by acute pulmonary complications still further obscures the issue. But as a rule differentiation may be readily made in uncomplicated cases by considering the onset and the symptoms during the first two days. These may be contrasted according to the following plan.

TABLE I.

| Onset | Influenza | Common colds |
|--------------------------|--|--|
| | Sudden | Insidious |
| Constitutional symptoms. | Marked— Headache. Fever and chills. Malaise. Prostration. Muscle pains. Anorexia. Vomiting. | Mild— Slight chilliness. Slight malaise. Slight muscular pains. Very little fever. |
| Local symptoms. | Mild or absent— Cough. Sore throat. Retrosternal discomfort. | Marked— Nasal discharge. Sore throat. Laryngitis. Tracheitis, etc. |

Besides this contrast in onset and symptoms, influenza is nearly always accompanied by a relatively slow pulse and low leucocyte count during the first three days. In general it can be said that influenza commences as a generalized infection and may produce localized symptoms on the second or third day; in contrast, common respiratory infections are definitely localized from the beginning.

All the cases that were used for this investigation were carefully questioned to discover the exact manner of onset and the time of appearance of each symptom.

* From the Department of Pensions and National Health, Deer Lodge Hospital, Winnipeg.

The percentage of cases showing the common symptoms in the first two days are shown in the table:

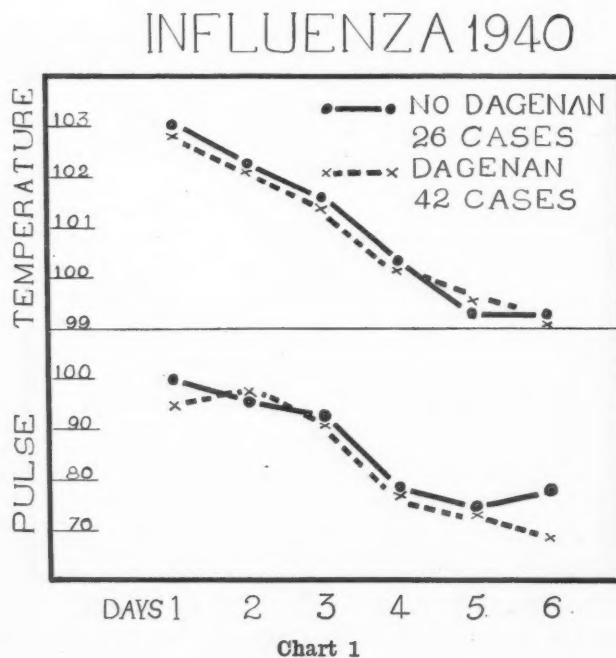
TABLE II.

| | First day | Second day |
|----------------------|-------------|-------------|
| Malaise..... | 81 per cent | 12 per cent |
| Headache..... | 71 " " | 13 " " |
| Cough..... | 60 " " | 22 " " |
| Chills..... | 60 " " | 15 " " |
| General pains..... | 23 " " | 64 " " |
| Sore throat..... | 24 " " | 24 " " |
| Nasal discharge..... | 9 " " | 21 " " |

This indicates the typical general invasion of influenza and the comparative absence of upper respiratory symptoms.

Treatment.—All patients were given full bed care in hospital wards; the same staff of nurses, orderlies and doctors attended all. The treatment in the two series was symptomatic and identical except for the use of sulfapyridine. Thirty grains were given every four hours for two doses, fifteen grains every four hours for four doses and seven and a half grains four times a day thereafter till discharge.

Results.—A composite chart¹ showing the temperature and pulse was made of each group, *i.e.*, the 42 treated with sulfapyridine and the



26 treated without. A chart is reproduced here showing the two graphs superimposed. It will be seen that they are almost identical at every point.

Complications.—Can it be stated from these results that sulfapyridine or related drugs need never be given in influenza? It seems reasonable to conclude that these have no effect on the uncomplicated infection, and this has been the experience with other virus diseases (except possibly in the case of trachoma). But in the series presented there were no complications in either the treated or untreated cases and it could therefore be argued that we are still in the dark as to the influence of the drug on the incidence and course of serious complications. This is an important objection since it is pneumonia that is the chief complication in influenza. During previous pandemics it has been usually assumed that pneumonia was due to secondary invasion by streptococci or pneumococci, the soil having been prepared by the antecedent virus infection. Serious doubt is cast on this pathological assumption by the well known fact that the influenzal pneumonias completely fail to respond to chemotherapy.

Further evidence suggesting that influenzal pneumonia is *sui generis* is supplied by radiological findings. The lesion is not so dense nor so massive as is usually the case in lobar pneumonia. It is at the same time more dense, more granular and less diffuse than in bronchopneumonia. It casts a shadow which is often indistinguishable from tuberculous bronchopneumonia; when the upper lobe is involved, which is often the case, the differentiation from tuberculosis cannot be made on x-ray plates alone.

Even if we admit influenzal pneumonia to be a pure virus pneumonitis, must we insist that sulfapyridine should not be given? It can still be argued that pneumococci and streptococci may contribute in severe cases, and particularly in those that are fatal. This possibility is supported by sputum examination and post-mortem findings which disclose the presence of a variety of virulent organisms. It is quite possible that these organisms may contribute to a fatal outcome. For this reason it is justifiable to prescribe prophylactic doses of sulfapyridine or sulfathiazole in all cases of influenza. One-half gram, three or four times a day, will inhibit the growth of secondary invaders and if given for four days only, will rarely have toxic effects.

CONCLUSIONS

1. Sulfapyridine has no effect on the course of uncomplicated influenza or upon complicating virus pneumonitis.

2. Since secondary invaders may possibly contribute to a fatal outcome, the administration of prophylactic doses of one of these drugs is a wise empirical precaution in all cases.

RÉSUMÉ

Bien que la sulfapyridine ne semble pas avoir modifié le cours de la maladie chez 42 malades atteints d'influenza, par rapport à 26 cas, également atteints d'influenza, mais non soumis au Dagenan, il paraît équitable de donner quand même la sulfapyridine dans l'influenza, mais à doses prophylactiques, 0.50 gm., 4 f.p.j., afin d'éviter les complications pulmonaires dues au pneumocoque ou au staphylocoque. JEAN SAUCIER

LOBAR PNEUMONIA TREATED BY MEANS OF SULFAPYRIDINE
AND SULFATHIAZOLE*

(RESULTS IN 181 CASES)

BY EDWARD S. MILLS AND EDWARD S. MURRAY

Montreal

THE present report deals with the results of treatment in 181 cases of lobar pneumonia admitted to the Montreal General Hospital between October 1, 1939, and March 31, 1941. In 173 cases the pneumonia was due to the pneumococcus; in 6, to the staphylococcus pyogenes; in 1, to the bacillus of Friedländer; and in 1, presumably to a virus.

All cases except 4 were treated by means of one or other of the sulfonamide drugs. Thirteen patients with a pneumococcal infection died,—a mortality of 7.7 per cent. Four of the six patients with staphylococcus pyogenes pneumonia survived, although one had a serofibrinous pericarditis and another a localized empyema. The patient with the suspected virus pneumonia recovered. The patient with Friedländer's pneumonia died.

In order to estimate properly the value of any treatment of pneumonia, data regarding age of the patient, duration of the disease before therapy, incidence of bacteriæmia, and methods of administration, are essential. These relevant facts for the pneumococcal cases are recorded in the following tables.

From the above figures it is evident that all but one death occurred in patients over 50 years of age. This observation is in conformity with the observations of other authors, who have also found a very low fatality rate in patients under 50 years of age. The one fatal case in our patients under 50 was a young man who was admitted *in extremis* and died within six hours

TABLE I.
AGE INCIDENCE IN PNEUMOCOCCAL CASES

| Age | Number of cases | Number of deaths |
|------------|-----------------|------------------|
| 10-20..... | 18 | 0 |
| 21-30..... | 33 | 0 |
| 31-40..... | 27 | 1 |
| 41-50..... | 36 | 0 |
| 51-60..... | 30 | 6 |
| 61-70..... | 13 | 3 |
| 71-80..... | 14 | 2 |
| 80+..... | 2 | 1 |
| Total..... | 173 | 13 |

of the institution of chemotherapy. Although justly included from a statistical viewpoint, it cannot be regarded as indicating a failure of therapy, since, as Finland and others have shown, no therapeutic effect may be expected in any case until the drug has been administered for at least six hours, whether by the oral or the intravenous route.

Incidence by sex.—In this pneumococcal series there were 131 males and 42 females. Although the incidence of the disease is invariably higher in the male, owing probably to occupational factors, the high proportion of males in our series is, in part at least, due to the preponderance of male beds in the hospital.

Duration of the disease before therapy.—One of the chief factors which influence the effect of chemotherapy and often the outcome of the illness is the duration of the disease before therapy is begun. Table II presents these relevant facts.

At first glance it would seem that a delay in instituting treatment does not lessen its effect.

* From the Medical Service, the Montreal General Hospital.

TABLE II.
PNEUMOCOCCIC CASES

| Days of disease before therapy | Number of cases | Number of deaths |
|--------------------------------|-----------------|------------------|
| 1 | 14 | 0 |
| 2 | 18 | 1 |
| 3 | 25 | 1 |
| 4 | 22 | 1 |
| 5 | 21 | 1 |
| 6 | 13 | 1 |
| 7 | 11 | 3 |
| 8 | 4 | 0 |
| 9-12 | 5 | 0 |
| Unknown | 40 | 5 |
| Total..... | 173 | 13 |

This is not the case, however. The fatality which occurred in the case in which therapy was instituted on the second day of the disease was the result of an acute coronary thrombosis occurring during the pneumonia. The death which occurred in the case in which therapy was begun on the third day of the disease was due to agranulocytosis, the only complication of this kind in the series. When these facts are taken into consideration, it would seem that if therapy is not begun until after the fifth day of the disease, the risk of a fatal outcome is about four times as great as it would have been, had it been started before the third day.

Incidence by type.—As has been the case in other series, the great preponderance of our pneumococcal cases typed into one or other of

TABLE III.

| Type | Number of cases |
|----------------------|-----------------|
| I | 16 |
| II | 27 |
| III | 22 |
| IV | 11 |
| V | 7 |
| VI | 2 |
| VII | 5 |
| VIII | 15 |
| IX | 1 |
| X | 0 |
| XI | 1 |
| XIV | 3 |
| XVII | 1 |
| XVIII | 3 |
| XIX | 3 |
| XX | 3 |
| XXI | 2 |
| XXIII | 1 |
| XXIV | 3 |
| XXV | 1 |
| XXVII | 2 |
| XXVIII | 1 |
| XXIX | 1 |
| XXXII | 2 |
| Mixed, VII, XX, XXIV | 1 |
| No type | 39 |
| Total | 173 |

the first eight groups. Thirty-nine cases did not type. One case was a mixed infection.

Incidence of bacteriæmia.—In evaluating the effectiveness of treatment on the basis of the number of fatalities, an important consideration is the incidence of bacteriæmia. The higher the percentage of bacteriæmic cases, the higher the death rate. This percentage is, in any year, a measure of the virulence of the disease. The relatively low incidence of bacteriæmia in this series would indicate that in the period under study the infection was of a mild type. This may account, in part at least, for the low fatality rate. The following table shows the total number of cases cultured, with the percentage mortality in the bacteriæmic and the non-bacteriæmic cases. The differences are striking.

TABLE IV.
INCIDENCE OF BACTERIÆMIA

| | Number of patients cultured | Fatalities | |
|---------------------|-----------------------------|------------|----------|
| | | Number | Per cent |
| With bacteriæmia... | 14 | 6 | 42.8 |
| Without bacteriæmia | 125 | 7 | 5.6 |

The incidence of bacteriæmia according to the type of invading organism and the fatalities in each type are shown in the following table.

TABLE V.
TYPE OF ORGANISM IN BACTERIÆMIC CASES

| Type | Number of cases | Number of deaths |
|-------|-----------------|------------------|
| I | 2 | 0 |
| II | 4 | 0 |
| III | 3 | 3 |
| VIII | 1 | 1 |
| XIV | 1 | 0 |
| XVIII | 1 | 0 |
| XIX | 1 | 1 |
| XXIV | 1 | 1 |

Type of therapy and method of administration.—In this series the sulfonamide drug was administered by the oral route, except in one or two instances where the patients were unable to tolerate adequate dosage by mouth and intravenous therapy was used as a supplement. The routine dosage was 30 grains as an initial dose, 15 grains two hours later, and then 15 grains every four hours till adequate blood drug levels were attained. When renal impairment was suspected, these dosages were materially reduced, since it was found possible to maintain satisfactory blood drug levels with

much smaller amounts. The importance of reducing the standard dosage of the sulfonamide drugs in patients with lowered kidney function should always be kept in mind.

LOBAR PNEUMONIA NOT DUE TO PNEUMOCOCCUS

1. *Staphylococcus pyogenes* pneumonia.—This series of 181 patients includes 6 cases of *Staph. pyogenes* pneumonia. In all but one this organism was the only pathogenic organism recovered from the sputum. In addition, in one patient the organism was recovered from the blood stream; in three, from the pleural cavity; and in one, from an empyæma cavity. All patients were males. Their ages were 75, 59, 42, 22, 18 and 18 years. The two oldest patients died, one as the result of multiple

3. *Friedländer's pneumonia*.—During the period under study one patient was found to have a Friedländer's infection, involving the right upper lobe. He was given a total of 350 grains of sulfapyridine, with apparent recovery. However, on the thirteenth day of normal temperature he died suddenly. Post-mortem examination showed a small pulmonary abscess, and a coronary thrombosis, which was the cause of death.

THE RESULTS OF THERAPY

In this series nearly all cases were treated by sulfapyridine. No patient received anti-pneumococcal serum. The oxygen tent was used when the condition of the patient seemed to warrant its use. In a few cases both sulfapyridine and sulfathiazole were used, though not at the same time. If after 48 hours of sulfapyridine therapy the desired effect had not been obtained, this drug was stopped and sulfathiazole was begun. The absence of pneumococci in the sputum of six patients and the subsequent isolation of the *staphylococcus pyogenes* in five of these cases were considered an indication for a change from sulfapyridine to sulfathiazole.

In general, patients with pneumococcal pneumonia who failed to improve under sulfapyridine therapy, likewise failed to react to other chemotherapeutic drugs. This was not the case with the patients who had *Staph. pyogenes* pneumonia. None of these responded to sulfapyridine, but sulfathiazole produced in three cases a gradual defervescence and improvement, and sulfamethylthiazole proved effective in one of the two cases so treated. In no instance did a prompt remission of fever or other symptoms occur.

The drugs used were as shown in Tables VI and VII. The rapidity of the response to chemotherapy in pneumococcal patients may be evaluated by a study of Table VIII. A great majority of the patients who responded favourably to the drug showed evidence of improvement during the first 24 hours. Twenty-four of the sulfapyridine-treated cases, however, yielded only to continued therapy.

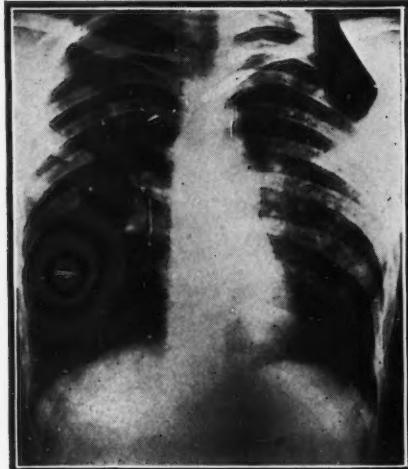


Fig. 1

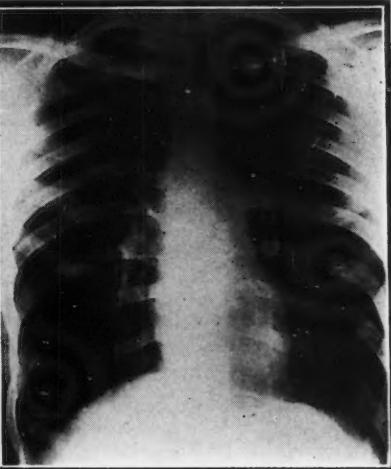


Fig. 2

pulmonary abscesses, and the other with increasing bacteriæmia. Of the four patients who survived, one had a localized empyæma; one, a lung abscess; and a third, serofibrinous pleurisy and pericarditis.

2. *Disseminated focal pneumonia*.—One patient, a boy of 19, was admitted because of a bilateral pneumonia, which failed to respond to either sulfapyridine or sulfathiazole. Many examinations of the sputum failed to reveal any pathological organisms. Although no confirmatory ferret inoculation was possible, the character of the lesions in the skiagram and their subsequent disappearance suggested a disseminated focal pneumonia of virus etiology. The skiagraphic appearance before and after therapy is shown in Figs. 1 and 2. The boy made a spontaneous recovery after treatment had been stopped.

TABLE VI.
PNEUMOCOCCUS PNEUMONIA

| Drugs used | No. of patients |
|--|-----------------|
| Sulfapyridine alone..... | 150 |
| Sulfathiazole alone..... | 7 |
| Sulfapyridine and sulfathiazole..... | 9 |
| Sulfamethylthiazole..... | 2 |
| Sulfapyridine and sulfamethylthiazole..... | 1 |
| None..... | 4 |
| Total..... | 173 |

TABLE VII.
STAPHYLOCOCCUS PYOGENES PNEUMONIA

| Drugs used | No. of patients | No. of deaths |
|--|-----------------|---------------|
| Sulfapyridine alone..... | 1 | 1 |
| Sulfapyridine and sulfamethylthiazole..... | 2 | 1 |
| Sulfapyridine and sulfathiazole..... | 3 | 0 |
| Total..... | 6 | 2 |

TABLE VIII.
*RESPONSE TO CHEMOTHERAPY IN PNEUMOCOCCIC CASES

| Type of response | Number of patients treated by | | | |
|-------------------------------------|-------------------------------|----------------|------------|-------|
| | Sulfa-pyridine | Sulfa-thiazole | Both drugs | Total |
| Normal temperature in 24 hours..... | 80 | 3 | 2 | 85 |
| Normal temperature in 48 hours..... | 18 | 2 | 4 | 24 |
| Late response..... | 24 | 0 | 2 | 26 |
| No response..... | 31 | 2 | 1 | 34 |
| Total..... | 153 | 7 | 9 | 169 |

*Four patients were not treated, because they appeared to be improving rapidly at the time of admission.

As in other reported series, no definite relation between the blood drug level and the response to therapy was noted. This is shown in the following table.

TABLE IX.

| Free sulfapyridine | Response | | |
|------------------------|----------|------|------|
| | Good | Slow | None |
| 1-2 mg. per cent..... | 2 | .. | .. |
| 2-3 " " " | 7 | 5 | 2 |
| 3-4 " " " | 10 | 1 | 1 |
| 4-5 " " " | 17 | 7 | 2 |
| 5-6 " " " | 16 | .. | 2 |
| 6-7 " " " | 7 | 3 | 1 |
| 7-8 " " " | 8 | 2 | .. |
| 8 and over " " " | 10 | 3 | 3 |

TOXIC REACTIONS DUE TO SULFAPYRIDINE

The toxic reactions noted in the sulfapyridine-treated cases were not alarming except in the

patient who developed agranulocytosis. This patient died. Nausea and vomiting were a feature in 12 of 34 cases in which specific reference was made to this complication. The other complications promptly disappeared with the cessation of treatment. The following complications were noted.

TABLE X.

| | |
|---------------------------|----|
| *Nausea and vomiting..... | 12 |
| Psychosis..... | 1 |
| Neuritis..... | 1 |
| Drug fever..... | 2 |
| Dermatitis..... | 0 |
| Agranulocytosis..... | 1 |
| Hæmaturia..... | 3 |

*In only about half of the case records was the absence of nausea and vomiting specifically noted.

SUMMARY AND CONCLUSIONS

1. One hundred and seventy-three patients with pneumococcal lobar pneumonia were treated by sulfonamide drugs, with a mortality of only 7.7 per cent.

2. The effectiveness of the drugs appeared to depend upon the duration of the disease before therapy was instituted and upon the degree of bacteraemia. Where treatment was started before the third day of the disease, the fatalities were almost nil. Bacteraemia imposed a mortality of 42.8 per cent.

3. Sulfapyridine appeared to have no curative effect on *Staph. pyogenes* pneumonia, whereas sulfathiazole and sulfamethylthiazole produced a slow but satisfactory response in four of the five cases so treated.

4. In one case of diffuse focal pneumonia, probably of virus etiology, neither drug was effective.

5. Toxic manifestations of sulfapyridine were infrequent. One fatal case of agranulocytosis is reported.

RÉSUMÉ

173 cas de pneumonie lobaire à pneumocoques ont été traités par les sulfamidés, avec une mortalité de 7.7 pour cent. La médication agit d'autant mieux que le malade est traité plus tôt après le début de la maladie et que le degré de bactériémie est moindre. En présence d'une pneumonie à staphylocoque pyogène la sulfapyridine est sans effet tandis que le sulfathiazole et le sulfaméthylthiazole agissent, bien que assez lentement. Dans un cas de pneumonie diffuse probablement à virus, et ayant guéri spontanément par la suite, les sulfamidés ont été sans effet. Une seule complication toxique fatale par agranulocytose fut relevée.

JEAN SAUCIER

LIPO-FIBRO-SARCOMA OF THE KIDNEY*

BY ROBIN PEARSE

Toronto

IN a recent issue of the *Journal of Urology*,¹ Charles Froug reports a case of lipo-sarcoma of the kidney. On searching the literature he was able to find but six other cases. Certainly most of the textbooks of pathology, written in English, have little or nothing to say on the subject, and the cases cited in Henke and Lubarsch do not seem to fit into the category.

Of the three cases which I now report, the first seems, both in the gross and histologically, exactly to resemble Froug's case. While in the gross appearance the second and third cases are dissimilar, yet the histological picture is exactly the same, namely, lipofibromata supporting sarcoma cells, which are invading the kidney. Probably the rate of growth of the benign and malignant elements differs in each case, hence the apparent difference on naked eye examination, so that the first tumour seems to arise from the renal capsule, the second from the fat in the hilus, and the third from the retroperitoneal fat.

CASE 1

Mrs. M.R., aged 53, consulted her physician concerning a vaginal discharge, which proved to be due to a benign cervical polyp. Abdominal examination revealed a mass in the left hypochondrium. The patient said, "Oh yes, I discovered that two years ago, but it never bothers me". However, she admitted it might have increased a little in size in the past six months. The patient was well nourished and in perfect health. On palpation, the mass appeared to be about six inches long, ovoid in shape, and moved on respiration. It seemed to be attached to the lower pole of the left kidney. A barium enema showed the transverse colon crossing in front of the tumour and the descending colon lateral to it.

Cystoscopy showed a normal bladder and ureteral openings, and normal urine was obtained from each side. Retrograde urograms seemed to indicate a large kidney extending from the 12th thoracic to the 1st sacral vertebra, but with pelvis and calyces normal in size and configuration. The ureter was displaced somewhat towards the midline (Fig. 1).

Operation.—March 10, 1941: Transperitoneal approach was selected as there was some doubt as to the origin of the mass, and I find it easier and safer to tackle large tumours by this approach. Under spinal anaesthesia the abdomen was opened by a left pararectus incision, and a large retroperitoneal tumour mesial to the descending colon was at once apparent. The posterior peritoneal layer was divided lateral to the colon and the colon with the anterior layer of the perirenal fascia pushed across the midline. This revealed at the level of the umbilicus a lobulated, soft, almost translucent tumour, purplish in colour, reminiscent of a jelly fish. Traversing the

tumour were several dilated veins, which seemed to have but membrane for a wall.

As the tumour was more fully exposed it was seen to arise from the lower pole of the kidney which at this stage appeared to be otherwise normal. The ovarian vein was now tied and divided; the renal pedicle clamped, divided and tied; and the tumour with the attached kidney mobilized. It was now apparent that a second tumour arose from the tip of the upper pole of the kidney, and this tumour partially surrounded the adrenal. The adrenal vessels were therefore divided, enabling removal of the whole mass with the adrenal gland in one piece (Fig. 2). The wound was closed and the patient made an uneventful recovery.

Pathological report.—The kidney proper measured 10 x 5 x 2.5 cm. Extending from the lower pole was a rounded mass 12 cm. in diameter. This mass was encapsulated and bright yellow in colour, except near the kidney where it was a blotchy yellowish pink. Extending from the upper pole was a fatty mass haemorrhagic in appearance, 4 cm. in diameter. In various spots on the external surface of the kidney there were areas of fatty tissue extending into the kidney cortex, and towards the upper pole there was a small reddish area surrounded by a white capsule.

Histological examination.—The large mass arising from the lower pole of the kidney consisted of adult fat cells with eccentrically placed nuclei. The capsule surrounding this mass was, in the region of the kidney, active histologically, the cells being spindle-shaped and closely packed, and occasional mitotic figures were noted. Other sections showed the extension of the fibrosarcomatous portion of this lesion into the surrounding renal fat. The tumour at the upper pole was histologically similar. The adrenal was normal.

CASE 2

Mrs. S.B., aged 35, admitted November, 1937, complaining of pain in left loin. Abdominal examination negative. Urinalysis: an occasional pus cell; faint trace of albumin. Cystoscopy showed a subacute cystitis, ureteral openings normal. The catheter passed easily to the right renal pelvis and clear urine was obtained. On the left side no type of catheter could be passed beyond the upper fifth of the ureter and no secretion could be obtained from this side. A plate was taken and then bilateral urograms made which showed a normal right kidney and an obstruction in the left ureter at the level of the upper border of the third lumbar vertebra. No opaque fluid passed this point, the kidney appeared to be about twice normal size. There was a faint shadow just above the tip of the catheter, suggestive of calculus.

Operation.—November, 1937. Under spinal anaesthesia, a left lumbar incision was made with the intention of performing uretero-lithotomy, but when the perirenal fascia was opened several large tortuous veins were seen, which made me suspicious that something unsuspected was wrong with the kidney, and exploration disclosed what I took to be a very large renal pelvis filled with papillary growth. On delivering the kidney, several small cortical abscesses were seen just under the capsule. The ureter was followed and a calculus felt in its lumen. The ureter was divided below the calculus and nephrectomy performed. The patient made an uneventful recovery.

Pathological examination.—When the specimen was divided longitudinally into two halves (Fig. 3), the kidney was found to be markedly distorted by a tumour in the hilus which compressed pelvis and kidney into a crescent. The tumour was but lightly attached to the kidney except at the upper end where it merged with

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Read at the Seventy-second Annual Meeting of the Canadian Medical Association, Winnipeg, June 26, 1941.

the kidney tissue. The kidney measured $15 \times 10 \times 6$ cm., and the tumour $10 \times 8 \times 4$ cm.

Histological examination.—The tumour was a type of sarcomatous growth composed of small areas of adult and fetal fat cells scattered through a very cellular type of cell. These latter cells grew in tangled profusion, and while the majority were more or less spindle-shaped, many tended to be quite large and have abundant acidophilic cytoplasm. Between these cells small vacuoles were seen. In one area at the upper pole the kidney tissue was invaded.

Subsequent history.—The patient was given post-operative x-ray therapy, and at the present time, June,

1941, three and a half years after operation, she is in good health.

CASE 3

H.L., male, 63. In September, 1932, he complained of loss of weight for eighteen months, the abdomen growing larger for eight months. He was emaciated, the abdomen distended, and the skin over it stretched and glistening. A dull percussion note was elicited all over the abdomen except in the left lumbar region. Thrill was transmitted in all directions throughout the abdomen.

Tentative diagnosis.—Ascites of unknown etiology. Dry tap on four occasions. Haemoglobin 90 per cent.

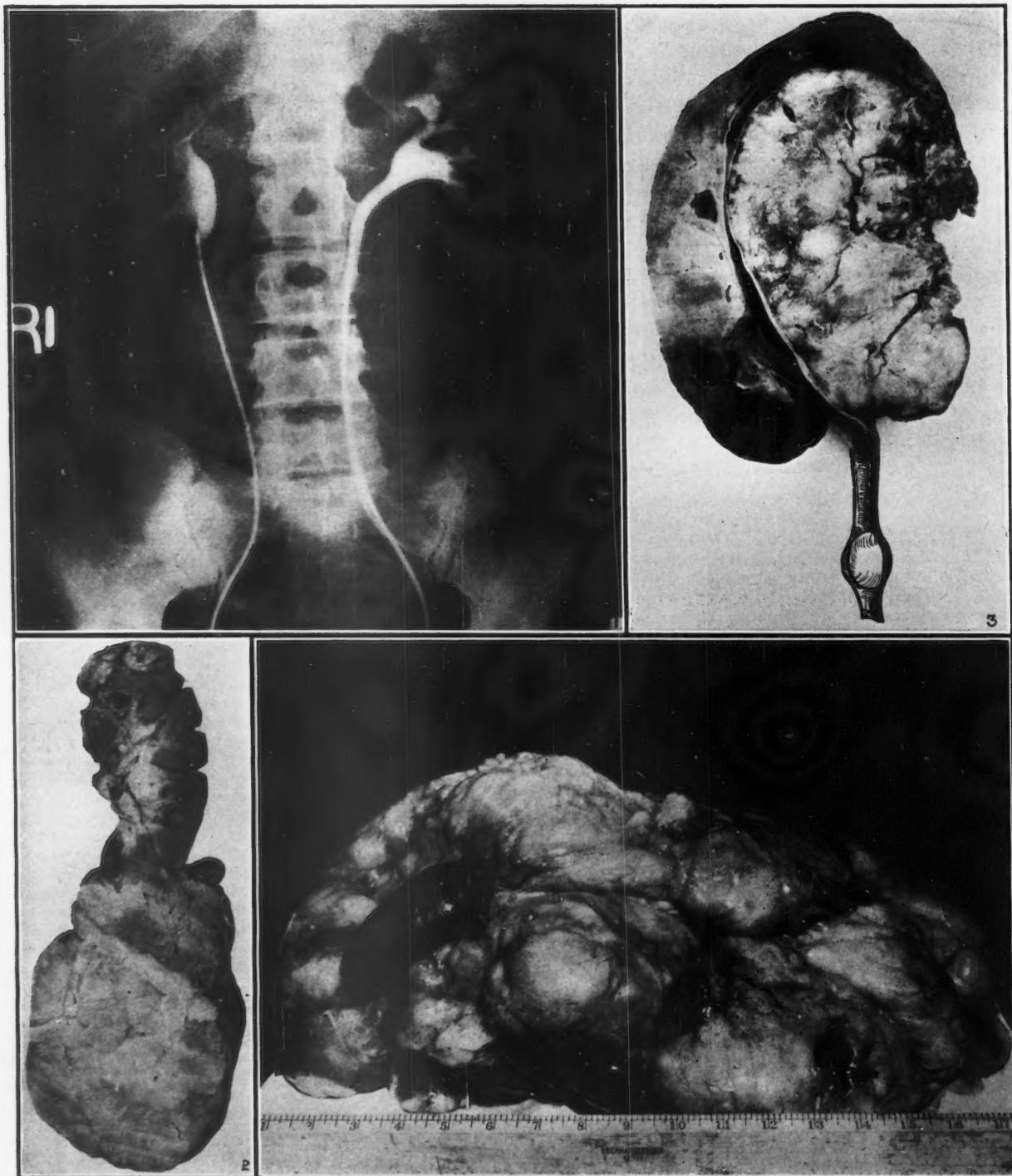


Fig. 1, Case 1.—Retrograde urogram. Fig. 2, Case 1.—Longitudinal section of tumour. Fig. 3, Case 2.—Longitudinal section of tumour. Fig. 4, Case 3.—The tumour.

Red blood cells, 3,900,000. White blood cells, 6,000. The Wassermann reaction was negative. Urinalysis: specific gravity, 1.028; no albumin; an occasional pus cell. A barium gastric series and enema showed the whole gastro-intestinal tract displaced to the left side of the abdomen. Thorotrust showed liver and spleen normal in size and position. Excretory urograms showed good function in each kidney. The right renal pelvis was slightly distorted and the ureter deviated mesially.

Operation.—(By W. E. Gallie; October 25, 1932). Under spinal anaesthesia the abdomen was opened through an upper right paramesial incision. No free fluid was found, and a second layer of peritoneum presented itself immediately under the anterior layer. On incising this second layer, part of the anterior surface of a very large tumour, resembling fat, was exposed. The posterior peritoneum separated readily from the tumour. The right rectus muscle was now divided transversely to obtain more room and the tumour mobilized from below upwards. Toward the middle of the tumour, difficulty was experienced in separating it from the posterior abdominal wall, and the operator worked along the edge until his hand could be passed below the liver and the tumour pulled downwards and forwards. As separation proceeded, it became evident that the right kidney was partially buried in the mass, its pedicle could not be identified and the kidney was removed with the tumour. The ureter was never seen and was probably divided and ligated unrecognized. Considerable haemorrhage occurred into the paravertebral gutter, which was finally traced to a rent three-quarters of an inch long in the vena cava. The bleeding was not violent and was easily controlled by the assistant with digital pressure above and below the rent, which was then closed with catgut on a curved intestinal needle. The patient made an uneventful recovery.

Pathological report.—A very large lobulated mass consisting chiefly of fatty tissue, weighing thirty-six and three-quarter pounds, and measuring 45 x 35 x 15 cm. (Fig. 4). The right kidney was almost completely buried in the tumour. At the lower pole of the kidney, the tumour was reddish in colour and histological examination showed the tumour to be infiltrating deeply into the kidney at this point.

Histological report.—The tumour consisted chiefly of fatty tissue supported by a stroma which varied con-

siderably in appearance in different regions. In general the stroma was myxomatous in character and showed the active proliferation of young connective tissue cells, the general appearance being that of a mesothelial malignant growth. Sections from the affected area in the kidney showed the normal cells to be replaced by atypical fibrous connective tissue cells, scattered among which were small amounts of fat.

Subsequent history.—September, 1933, the patient looks well and feels well. Palpation shows no evidence of recurrence in abdomen. Circulation in legs good, no oedema. October, 1933, one year after operation, the patient complained of thirst and a heavy feeling in the abdomen. A mass about 12 cm. in diameter could be felt in the right upper quadrant, probably a recurrence of the original growth. High voltage x-ray therapy was given but did not stay the growth of the recurrence, and the patient slowly became cachectic and died of amyloid disease on September 25, 1934, two years after the operation.

Autopsy.—Autopsy showed recurrence at the site of the original tumour to almost the original size. Amyloid disease of the liver, spleen and the remaining kidney. There were no metastases.

I am indebted to Dr. W. E. Gallie for permission to report Case 3, and to Dr. W. L. Robinson for the pathological and histological reports.

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RÉSUMÉ

Trois cas de lipo-fibro-sarcome du rein sont rapportés, à ajouter aux 6 ou 7 cas mentionnés dans la littérature médicale. Les observations ci-dessus consignées comprennent l'histoire clinique, les notes de l'opérations et les examens histologiques. Chez nos 3 malades, le premier est superposable à celui de Froug. Les 2 autres sont assez dissemblables au point de vue macroscopique mais l'image histologique est identique: chaque élément tumoral, bénin ou malin, évolue pour son propre compte et les caprices du développement tumoral explique les apparences de dissemblance.

JEAN SAUCIER

RENAL LESIONS WITH NEGATIVE URINE FINDINGS*

BY EARLE R. HALL

Vancouver

IN the practice of medicine upon occasion a pathological entity is found with absence of the symptom-complex usually characteristic of the condition. This also applies to various clinical and laboratory examinations, where a departure from the normal is usually noted. The majority of kidney lesions will sooner or later produce some change in the normal findings, following examination of the urine itself. This may be indicated, among the commonest, by the presence of haematuria, pyuria, and albuminuria. With this discovery the possibility of some abnor-

mality of the urinary system is then considered, and following a careful urological investigation the diagnosis usually becomes apparent.

There are, however, cases with kidney damage, in which urine examinations do not show any abnormal findings. In many of these instances the presence of characteristic symptoms, aided, perhaps, by a careful history suggestive of some renal disturbance, leads to an exhaustive examination of the urinary tract. In this manner, despite the presence of negative urines, a diagnosis of the existing kidney lesion is made. On the other hand, kidney lesions lacking the usual symptoms may exist with no change in the urinary findings. This makes the diagnosis diffi-

* Read at the Seventy-second Annual Meeting of the Canadian Medical Association, Winnipeg, June 26, 1941.

cult, as none of the symptoms that are present appear to be referable to the urinary system.

Symptoms due to disorders of the urinary tract may be so suggestive of lesions of the gastro-intestinal tract, that the correct diagnosis is obscured. This fact has been well recognized for many years, and numerous writings refer to the frequency with which such cases have been operated upon before the true condition has been recognized. Cecil¹ commented on this, and remarked that abdominal exploration had been performed in 30 per cent of a group of patients with hydronephrosis. Gastro-intestinal symptoms are frequently encountered in diseases of the urinary organs, particularly of the kidneys. In many instances they are manifestations of uræmia and an evidence of failing renal function. At other times, such symptoms are obstructive in origin, and result from the pressure of large renal tumours on adjacent structures. The marked gastro-intestinal disturbances which sometimes arise from catheterization of the ureters, pyelography, calculous disease, or hydronephrosis, however, have a possible explanation in reflex impulses along sympathetic nerves.

The kidney is innervated by sympathetic fibres. Since one of the chief functions of the sympathetic nervous system is to put the various organs of the body in relationship to one another and assure their proper co-ordination, it is not unreasonable to suppose that dysfunction in one organ should give rise to symptoms in other organs, through the relationship thus provided. Such phenomena have been recognized for a long time and have been called "viscero-visceral reflexes". Familiar examples are the spasms of the gastric or intestinal musculature from an inflamed appendix, and reflected pain in the testicle due to a stone in the ureter or renal pelvis.

Hydronephrosis, usually unilateral, is one of the commonest lesions found with normal urine. It often exists with some disturbance of the gastro-intestinal tract as the only symptom. This varies from vague abdominal discomfort to attacks of nausea and vomiting, often associated with frequent belching of gas. Pain, often present, in no way resembles that of renal origin, but appears to involve some portion of the abdomen, especially the epigastrium. Colby, in 1932, reported three cases of hydronephrosis with gastro-intestinal symptoms. Two of these had negative urines which were also

sterile on culture. The other had no urinary symptoms, though the urinary sediment contained a few leucocytes. A sentence from the report of one of his cases is characteristic, "The urinary tract was examined for the sake of thoroughness and because of the other negative findings although none of the symptoms suggested any renal lesion". During 1936, in the *Canadian Medical Association Journal* (35: 141), I reported a case of hydronephrosis having attacks of abdominal pain and vomiting as the only manifestations present. The urine examination on numerous occasions had been completely negative. It was interesting to note that the boy's symptoms had been considered due to disturbances of the gastro-intestinal system. My purpose at that time in carrying out investigation of the urinary tract was the result of palpating a supposedly large kidney on one side.

Renal tumours, though one of the cardinal signs is haematuria, may exist with negative urine. This is no doubt more often found in children having an embryonal, or the so-called Wilms tumour. Their characteristics of rapid growth and encapsulation without tendency to break through into the renal pelvis reverse the order of the cardinal evidences. Growth and pain predominate, and haematuria is relatively rare. A fact of value in diagnosis is that all other tumours in the upper part of the abdomen in children are so rare that any neoplasm of this kind in infants and children, though the urine is negative, can be called a renal tumour with small chance of error.

Although most neoplasms of the kidney in adults have haematuria as the initial sign, there are those who never see blood passing in the urine, and examination of the latter at any time is entirely negative. It is interesting to note that some of these have fever as the only symptom. Creevy, in 1929, reported two cases having pyrexia as a predominant symptom, with one having completely negative urine examinations. He pointed out that it was Israel, in 1911, who stated that rise of temperature may be a symptom of renal tumour in the absence of other characteristic findings. Israel also mentioned at this time that he had observed febrile phenomena in the mixed renal tumours of childhood. Ljunggren, in 1932, reported a case of renal tumour with fever as the only feature. This was a hypernephroma and the urine at no time showed any change from

normal. It may be of interest to note the following comment on this case, "The patient was troubled for several months with pyrexia and disturbances in her general state of health (loss of appetite, fatigue, loss of weight) and, who, during this time had been examined by nine doctors—specialists in various branches of medicine—without the cause of the fever having been revealed. The patient was admitted to hospital under the diagnosis of pyrexia of unknown cause. In the course of a careful, systematic investigation a general x-ray picture was taken of the abdomen. It was then found that the left kidney outline appeared to be enlarged. This subsequently led to the suspicion of tumour. Pyelography was carried out and the suspicion of tumour was confirmed." The cause of a rise of temperature in cases of renal tumour is not likely to be of uniform nature. Sometimes the fever is caused by a complicating pyelitis and pyelonephritis, because neoplastic kidneys are often the seat of more or less marked inflammatory processes in the mucous membrane of the renal pelvis or in the intact renal tissue. In some cases it has been considered to be due to absorption of toxic products of necrosis in the tumorous tissue; in others the temperature appears to occur apart altogether from infection. It has been suggested as the result of entrance into the blood stream of small amounts of foreign protein detached from the growth, and, in this manner, is anaphylactic in nature.

It is not surprising to find metastases a common complication of malignant renal tumours. This is true of the commonest of all kidney tumours—the hypernephroma. What is perhaps not so generally realized is that in these cases it is by no means rare for a metastasis to appear as the first evidence of the disease. There may have been no history of renal or urinary symptoms, and negative urine may have always been obtained on examination. Metastases at times may cause confusion, and in the absence of a biopsy investigation of the kidneys should not be forgotten.

Renal calculi may be present in instances where examination of the urine is negative. Haematuria is the rule in the presence of a kidney stone, but the quantity of blood passed is variable in amount, and may be present only in microscopic quantities. This indicates the importance of microscopic examination of the urine, as, without it, many would be noted as

being free from haematuria. It also shows the necessity of repeated examinations. Following several negative findings, the discovery of a few cells would lead to a more complete investigation of the urinary tract. In my experience, patients with renal calculi showing negative urines often have symptoms referable to the gastro-intestinal system. Pain, often present, is of a dull ache, and not the typical paroxysmal type.

I wish to present briefly reports of four cases of renal lesions all having negative urine ex-

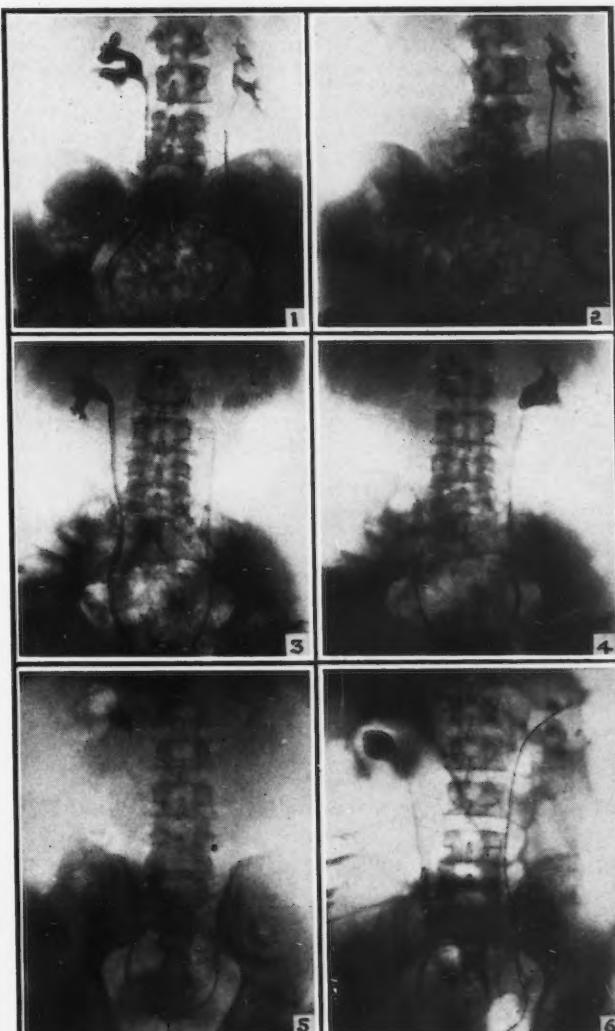


Fig. 1, Case 1.—Right pyelogram appears normal except for indication of some pressure on the lower calices from below. Enlarged right kidney outline. Displacement of right ureter medially. Fig. 2, Case 1.—Normal left pyelogram. Enlarged right kidney outline. Medial displacement of the right ureter as indicated by the course of the right ureteral catheter. Fig. 3, Case 2.—Normal right pyelogram. Calculus in pelvis of left kidney. Fig. 4, Case 2.—Pyelogram of left kidney showing filling defect due to presence of a stone. Fig. 5, Case 3.—Normal right pyelogram. Enlarged left kidney outline. Catheter in left ureter could not be passed beyond the iliac crest. Catheter on right has been partially withdrawn in making pyelogram. Fig. 6, Case 4.—Huge bilateral hydronephrosis with multiple calculi in left kidney.

aminations. These embody many of the points I have mentioned. They are conditions which, when present, as a rule produce some abnormal urinary finding, following examination of the urine itself. In this study I have not included uncomplicated hydronephrosis, polycystic kidneys, or the mixed tumours of infancy and childhood, as these are conditions often existing with normal urine.

CASE 1

Mrs. J.H.B., aged 58, for about six months had been complaining of fatigue, listlessness, and slight loss of weight. For two months she had been having elevation of temperature at night, with sweating. A general examination, with particular attention to the chest, was pronounced negative. Recent examination had disclosed a firm tumour in the upper right quadrant, suggestive of renal involvement.

Cystoscopy and pyelography disclosed normal functioning kidneys and normal pyelograms, except that the lower calyces of the right kidney appeared to have some pressure from below (Fig. 1). The course of the right ureter was also much more medial, as if from some extrinsic pressure. The outline of the right kidney appeared much enlarged (Fig. 2). A diagnosis of right kidney tumour was made. This was substantiated at operation, and a right nephrectomy was carried out. This specimen weighed 390 g., and was a hypernephroma involving the lower pole.

CASE 2

W.T., male, aged 51, had been complaining for about six months of pain in the upper left abdominal quadrant. This had become progressively worse, with radiation to the epigastrium, and associated with nausea and vomiting. He developed fever and was admitted to hospital. A general examination was negative. The abdominal pain appeared to be of intestinal origin, and in the course of x-ray investigation of the colon a shadow resembling a calculus was disclosed in the region of the left kidney (Fig. 3). Cystoscopy and pyelography disclosed normally functioning kidneys, and urines from

both were sterile on culture. A stone was present in the left renal pelvis (Fig. 4). Following pyelotomy and removal of the calculus he had complete recovery from his symptoms.

CASE 3

Capt. A.S., male, aged 58, had been complaining of pain in the upper left abdominal quadrant, of eight months' duration. This was becoming much more severe, and associated with nausea. The pain was always localized. He became gradually weaker and was admitted to hospital. Examination disclosed a severe secondary anaemia and a palpable tumour which appeared to involve the left kidney. Cystoscopy and pyelography were carried out. The right kidney tract was normal. I could not pass a catheter more than about half-way up the left ureter, and there was no urine from this side. The left kidney outline appeared larger than normal (Fig. 5). Intravenous urography did not show any excretion from the left kidney. A diagnosis of left renal tumour was made and nephrectomy carried out. This specimen weighed 467 g., and the pathological diagnosis was papillary adenocarcinoma of the kidney.

CASE 4

J.T., male, aged 53, for 6 months had been complaining of periods of general malaise, weakness, and loss of appetite. He would also notice that considerable gas was present and some abdominal distension during these periods. Finally, he had a sudden onset of abdominal pain, which at first was generalized but later appeared to localize in the upper left quadrant, and radiated posteriorly to the left lumbar region, and downward to the lower left quadrant. This became very severe, and he was admitted to hospital. A flat x-ray showed calculi present in the left renal area. Cystoscopy and pyelography showed a huge right hydronephrosis and left hydronephrosis with calculi (Fig. 6). The urine from both kidneys was negative—also sterile on culture. He had diminished renal function, as was also borne out by the blood chemistry. This showed nitrogen retention—non-protein nitrogen 75 mg.

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TROUBLE SOME SKIN DISEASES IN INFANCY AND CHILDHOOD*

BY ARTHUR R. BIRT, M.D.

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SKIN diseases that are apt to be troublesome in infancy and childhood may be divided into two main groups: (1) those which appear at all ages, but most frequently before puberty, and (2) those which appear, for all practical purposes, only before the age of puberty. In order to establish which of these skin diseases occurred most frequently during infancy and childhood a survey was made of the records of the Children's Hospital of Winnipeg. All diagnoses listed in the department of dermatology

for the past nine years were reviewed. The percentage of incidence of the common conditions encountered was estimated (Table I). It was compared to a similar survey reported by Dixon,¹ from the Hospital for Sick Children, Toronto, and also to Goodman's² statistics of the ten most common skin diseases, based on an analysis of nearly one million published cases.

It will be seen that eczema accounts for about 20 per cent of the total reported diagnoses, both in children and adults. During the past few years eczema has become recognized as a form of cutaneous reaction, rather than a disease entity. Many cases previously recorded

* From the Department of Dermatology, Children's Hospital, Winnipeg.

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as eczema are now diagnosed as forms of contact dermatitis (dermatitis venenata). Therefore in compiling these statistics all forms of eczema and dermatitis venenata were grouped together. Infantile eczema is the most troublesome member of this group encountered in childhood. In our clinic, 6.5 per cent of all cases were due to it. The incidence of infantile eczema was not recorded in the other series of cases.

Impetigo contagiosa was the commonest single diagnosis made in our series of cases. It appeared five times as often as in the adult group. Scabies also showed a greatly increased frequency in childhood. Tinea, in all its forms, was fairly constant in the three groups. Whilst not fourth in incidence, ringworm was included because it is primarily a disease of childhood, and because it presents many difficulties in diagnosis and treatment.

TABLE I.

PERCENTAGE OF INCIDENCE OF FOUR COMMON SKIN DISEASES

| Series | Winnipeg Children | Dixon Children | Goodman All ages |
|---------------------------|----------------------|-------------------|---------------------|
| Age | | | |
| No. of cases .. | 5,357 | 2,760 | 973,090 |
| percentage .. | | percentage .. | percentage .. |
| Eczema | 19.0 | 23.0 | 24.0 |
| Impetigo contagiosa .. | 21.0 | 18.0 | 3.8 |
| Scabies | 16.0 | 8.0 | 4.8 |
| Tinea | 5.2 | 3.0 | 3.5 |

Impetigo contagiosa and scabies are diseases of the skin that may appear at any age. They are particularly prevalent in childhood and may present certain problems to the paediatrician.

Impetigo contagiosa is a superficial inflammation of the skin characterized by discrete, thin-walled vesicles and bullæ which rapidly become pustular, and dry, forming loosely adherent golden crusts. According to Sabouraud³ the condition is caused by streptococci, but soon becomes a mixed infection with staphylococci. Recently Epstein⁴ has described very carefully two types of impetigo. He names them streptococcal impetigo and staphylococcal impetigo. The lesions in the streptococcal type are thick dirty yellow crusts that have the appearance of being stuck on (Fig. 1). The original vesicle is so short-lived that it is usually not observed. The regional lymph glands are often swollen. In the staphylococcal type the lesions are primarily bullous (Fig. 2). In contradistinction to the streptococcal type

the blisters usually persist for days. When they rupture, the lesions become covered with thin, flat, varnish-like crusts. He also suggests that there is probably a third type of impetigo caused by a mixed infection of the two organisms. Epstein was able to demonstrate a close agreement between clinical and bacteriological diagnosis in a large series of cases. *Staphylococcus aureus* was the organism usually found in the bullous type of disease. This is particularly interesting because it is now possible to explain the long recognized associa-



Fig. 1.—Streptococcal impetigo. Fig. 2.—Staphylococcal impetigo. Fig. 3.—Tinea capitis caused by *M. audouini*. Fig. 4.—Tinea capitis caused by *M. lanosum*.

tion between impetigo contagiosa and pemphigus neonatorum. The treatment of impetigo contagiosa does not present much difficulty. The commonest error is to start treatment without removing the crusts. They may be removed with a boracic acid starch poultice or warm olive oil and then the medication applied. Ammoniated mercury ointment is still the treatment of choice in the majority of cases. Recognition of the causative organism by clinical methods should offer a guide to those who try the local application of the sulfanilamide group of drugs.

Scabies is an infectious disease of the skin caused by *acarus scabiei*. The presence of more than one case in a family and a history of noc-

turnal itchiness suggests the diagnosis. The pathognomonic lesion of scabies is the burrow. It appears as a slightly elevated grayish, straight or tortuous line in the skin with a small vesicle at one end. They involve chiefly the interdigits of the hand, the wrists, the axillæ, the nipples, the lower abdomen, the buttocks, and the genitalia. In infants the palms and soles are often affected. Frequently the burrows are destroyed by scratching and multiform itchy lesions take their place.

Sulphur is usually the treatment of choice. The twenty-four hour treatment as recommended by Lomholt⁵ proves very efficacious if attention is paid to details. The patient receives a cleansing bath with soap and water, using a brush to go over the burrows. Then the ointment is applied to the whole body from the neck down. Tight fitting underwear that extends to the ankles and wrists is put on, with socks on the feet and socks or gloves on the hands. Then the patient goes to bed for twenty-four hours. After a cleansing bath and change of underclothes and bed linen the majority of patients are cured. Full strength ointment may be used at all ages. Very few cases of sulphur dermatitis are encountered. Successful treatment depends on following the routine outlined and on treating all contacts at the same time. The use of benzoyl benzoate shows signs of promise and is much simpler of application than the method outlined. In a very limited experience with it, I have seen two cases of severe vesicular dermatitis.

A skin condition that is found in childhood and commonly is mistreated is impetigo contagiosa superimposed on scabies. The presence of impetiginous lesions between the fingers, on the wrists, and around the genitalia, should always suggest the diagnosis of scabies. The treatment of the coccic infection will be unsatisfactory until the underlying acari are destroyed. If the infection is mild the scabies may be treated at once by the usual methods; if the impetigo is widespread one or two baths with potassium permanganate (1:4,000) will dry the blebs and crusts, and prepare the skin for the application of sulphur.

Infantile eczema is the name given to eczema that appears before the second year of life. It is the most troublesome of all the skin conditions encountered in infancy. The term eczema denotes a characteristic form of cutaneous reaction rather than a disease entity. It is an inflammatory reaction in the uppermost portions of

the skin characterized clinically by one or more of the following: erythema, papules, vesicles, crusts, scales and thickening. In the infantile type it usually begins on the cheeks, and then may spread to the body and extremities. The etiological agents are usually contact allergens or foods. The immediate prognosis is good, the majority of cases tending to heal spontaneously after the age of one year. Some of these children, having inherited allergic tendencies, are known as atopic and are liable to develop disseminated neurodermatitis, asthma or hay fever later in life. The adequate treatment of infantile eczema depends on (1) removing the cause of the allergy, and (2) using suitable local therapy.

A routine for the investigation and treatment of infantile eczema has been developed during the past few years at the Children's Hospital of Winnipeg.⁶ The results obtained from it have been much more satisfactory than by the use of local therapy alone. Briefly, the routine is as follows.

1. An accurate history is taken. Particular note is made of substances coming into contact with the skin and of all articles of food in the diet. The addition of food or contactants is related, if possible, to the onset or recurrences of the dermatitis. If a very obvious cause of the dermatitis is not found, then the patient is given only local therapy for two weeks. This will help determine whether the dermatitis is due to contact or food allergens.

2. The local therapy followed is: (a) Stop the use of soap. Cleanse the skin with oil. (b) No wool or feathers may be used. (c) Restraine the baby from scratching either by tying the arms and legs to the sides of the crib, or by sewing tongue blades into the sleeves of a shirt so that the elbows cannot be bent. (d) If the lesions are characterized by erythema, papules and scaliness, linimentum calaminæ, C.F., is applied in the daytime and Lassar's paste is used at night. (e) If in addition there are vesicles and crusts, secondary infection is probably present. Remove the crusts with starch poultices and apply an ointment containing liquor carbonis detergens, drachms one, to an ounce of unguentum hydrargyri ammoniati. (f) If there is much thickening of the skin, crude coal tar ointment may be applied for three days.

It is important at all stages of infantile eczema, to keep the lesions covered with the





medication and not to apply it just two or three times a day.

3. If the child does not improve markedly with local therapy, an endeavour is made to establish food allergens as a cause of the dermatitis. Skin testing has not proved satisfactory for this. More information can be gained by the use of elimination diets. An elimination diet is one containing only a few foods that are known from past experience to be innocuous to most allergic patients. Such a diet, suitable for the age of the child is prescribed for two weeks. Any amount of any of the foods listed may be eaten, but even minute amounts of any other food, if eaten, may upset an otherwise successful trial. If the patient does not improve on the diet he is sensitive to some article of food in the diet, or some contactant, and the search is made in that direction.

4. If the patient improves on the diet he is sensitive to food allergens. Then single foods are added, one at a time, at four day intervals. If a relapse occurs after an addition, that food is removed completely from the diet, and a few days are allowed for the skin to return to its previous state before making more additions. The order in which foods are added to the diet depends on the history given and the age of the patient. As a general rule we try to add milk first, and then wheat. Then fruits and vegetables are added at four day intervals. Foods containing egg are left to the last. It is important that the children be kept as much as possible on properly balanced diets. Their caloric requirements must be met, and vitamins and minerals added where necessary. Dicalcium phosphate is given to those children who cannot take milk, or milk substitutes. Cevitamic acid is given if the antiscorbutic fruits are not tolerated and crystalline vitamin D is given to those children who react to fish oil.

Itchiness is a valuable aid in controlling the diet. As long as the child is itchy and desires to scratch all the allergens have not been removed. The tendency to scratch returns soon after the addition of an offending substance.

The most difficult problem encountered in infantile eczema is the child who is sensitive to milk. To date no adequate milk substitute has been developed. Evaporated milk, particularly if acidified, causes less reaction than whole milk and is incorporated in most of our elimination diets. The breast-fed child who does not

react to local therapy is difficult to treat. Usually the best results are obtained by weaning and putting them on a properly controlled diet.

Tinea capitis presents a constant challenge to those treating skin diseases of childhood. It is caused by invasion of the hairs of the scalp by fungi. The diagnosis is based on (1) clinical examination; (2) the fluorescence of infected hairs when examined in a darkened room with filtered ultra violet light (Woods' light); and (3) the microscopical examination of hairs. The actual species of fungus present can only be determined by making cultures on Sabouraud's standard media. The importance of this has not been generally recognized. The prognosis and treatment in tinea capitis depends entirely on the type of fungus causing the infection. Ringworm of the scalp found in this part of Canada is caused by (1) the microsporons, and (2) the trichophytons. On culture the microsporons found are *M. audouini*⁷ and *M. lanosum*. The species of trichophyton found here are *T. album*⁸ and *T. gypseum*. In 1932, while working with Davidson and Gregory,⁷ we found that it was possible to tell the type of fungus causing the infection, by the clinical appearance of the scalp. This has been demonstrated since by Lewis,⁹ Sulzberger,¹⁰ and others. The important clinical features of each type of fungus infection are as follows.

1. *M. audouini* produces the human type of infection. It occurs nearly always in young children, is spread by contact between children and tends to heal spontaneously at puberty. It appears on the scalp as one or more round or oval discrete patches (Fig. 3). The hairs are lustreless and broken off a few millimeters from the scalp, which is covered by fine gray scales. There are no signs of active inflammation.

2. *M. lanosum* produces the animal type of infection. It is usually spread by contact with infected cats or dogs.¹¹ It may occur at any age, but most commonly in childhood. There may be many lesions on the scalp. They are roughly oval and have short broken lustreless hairs (Fig. 4). The areas show signs of inflammation. The skin is a dusky red in colour and is usually covered by a gray or brownish crust. If the crust is lifted off the underlying surface is moist and red. Very rarely this type of ringworm produces pus.

3. *T. album* and *T. gypseum* produce pustular or cattle ringworm. The clinical picture of kerion with its large boggy masses on the scalp, angry red in colour, dotted over with perifollicular abscesses and almost denuded of hair should not present a difficult problem in diagnosis. The prognosis with this type of infection is good.

The ability to differentiate clinically between the human type of ringworm caused by *M. audouini* and the animal type of ringworm caused by *M. lanosum* is of great aid in their treatment. It has been shown that the animal type of ringworm tends to heal itself and that if such simple applications as boracic acid starch poultices, or white precipitate ointment are applied, the lesions will heal in about six to eight weeks. The human type of ringworm does not respond to local therapy and its adequate treatment requires epilation by x-ray or thallium acetate. If there is any doubt concerning the diagnosis of the type of infection on clinical grounds, and cultural confirmation of type cannot be obtained, it would appear advisable to wait two months before using such treatments as x-ray or thallium acetate.

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RÉSUMÉ

Les dermatoses prépubertaires les plus fréquentes sont l'eczéma, l'impétigo, la gale et la teigne. L'impétigo varie dans l'aspect de sa vésicule selon son origine streptococcique, staphylococcique ou mixte. L'impétigo staphylococcique est habituellement bulleux. Le traitement à l'onguent mercuriel et ammoniacal devra être précédé de l'enlèvement des croûtes. Le signe pathognomonique de la gale est le sillon, surtout localisé aux espaces interdigitaux. Le soufre est le traitement de choix. Dans la gale impétiginisée il faut d'abord détruire les acari. L'eczéma infantile est d'un maniement difficile; la cause en est habituellement les allergènes de contact ou un régime inapproprié. Lorsque la thérapie locale est instituée, on doit cesser l'usage du savon, empêcher le grattage, proscrire la laine et les plumes, administrer la lotion à la calamine, le jour, et la nuit, la pâte de Lassar, traiter l'infection secondaire, traiter la pachydermie s'il y a lieu. Dans tous les cas, il faut essayer de corriger le régime alimentaire. Les teignes sont causées par des champignons: les microsporons et les trichophytons. Le *microsporon Audouini* cause la teigne humaine; elle évolue sans signes d'inflammation. Le *microsporon lanosum*, parasite les chiens et les chats, mais il peut aussi parasiter les enfants; cette teigne s'accompagne de signes inflammatoires assez marqués. Les trichophytons font de gros abcès périfolliculaires dénudés de cheveux. Pour toutes les teignes le traitement est simple: acide borique, cataplasmes à l'amidon, onguent au précipité blanc. On devra attendre l'épreuve du traitement simple avant de recourir au thallium et aux rayons X.

JEAN SAUCIER

THE PROGNOSIS AND TREATMENT OF STAPHYLOCOCCAL SEPTICÆMIA*

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IN recent years there has been a revival of interest, among both clinicians and laboratory workers, in staphylococcal infections. Therapy has naturally been of special interest to physicians and numerous articles have been published giving the results obtained with one or the other routine therapeutic technique.

The treatment of staphylococcal septicæmia has received particular attention because of the gravity of the disease. The results obtained are difficult to evaluate because the disease is not

sufficiently common to permit the collection of large series with adequate controls in a reasonable time in any one clinic. There has been a tendency, therefore, to compare the mortality rate obtained with a particular form of therapy with either the mortality rate prevailing in the writers' institution prior to the introduction of the therapeutic agent under consideration, or with published statistics of other institutions.

The mortality rates as given by various writers vary considerably.

The table shows that there is a mortality of from 61 to 91.4 per cent in cases with staphylococcal septicæmia without specific treatment. Our death rate, 61 per cent in the present series,

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TABLE I.

| Author | Number of cases | Mortality percentage |
|--|-------------------|----------------------|
| <i>No specific treatment.</i> | | |
| Longacre, Zayteff-Jern, Melaney ¹ .. | 54 | 81.4 |
| quotes | Lawson (1925).... | 80.0 |
| | Scott (1936).... | 81.0 |
| Mendell ² | 35 | 83.0 |
| quotes | Reimann..... | 79.0 |
| | Rowenow and Brown | 66.0 |
| Lowenstein ³ | 57 | 61.0 |
| | (collected) | |
| Baker and Shands ⁴ | 43 | 76.0 |
| Mitchell and Chapman ⁵ | 20 | 75.0 |
| | (osteо excluded) | |
| Stookey and Scarpellino ⁹ | 177 | 91.4 |
| <i>Bacteriophage treated.</i> | | |
| MacNeal and Frisbee ⁷ | 100 | 75.0 |
| Longacre, Zayteff-Jern and Melaney ¹ | 36 | 47.0 |
| <i>Antitoxin treated.</i> | | |
| Stookey and Scarpellino ⁹ | 17 | 53.0 |
| Dolman ⁸ | 93 | 55.0 |
| Baker and Shands ⁴ | 48 | 38.0 |
| <i>Septicæmia with osteomyelitis;</i> | | |
| <i>No specific treatment.</i> | | |
| Baker and Shands ⁴ | 30 | 70.0 |
| Joyner and Smith ⁶ | 15 | 46.0 |
| Mitchell and Chapman ⁵ | 18 | 39.0 |
| Neuhof (quoted by Mendell) ² | 27 | 56.0 |
| Stookey and Scarpellino ⁹ | 13 | 38.0 |
| <i>Antitoxin treated septicæmias with osteomyelitis.</i> | | |
| Dolman ⁸ | 32 | 31.0 |
| Baker and Shands ⁴ | 35 | 25.7 |
| Joyner and Smith ⁶ | 13 | 23.0 |

falls in the lower limits of this range and is based on the cases diagnosed in the Children's Memorial Hospital, 41 in all, that occurred between the years 1933 to 1940 inclusive. An examination of Table II, which gives the yearly incidence, mortality rates and the number of blood cultures taken expressed as a ratio to the number of admissions, reveals that the above figures may be quite erroneous.

TABLE II.

| Year | Ratio of hospital admissions to blood cultures | Total cases | Number died | Percentage mortality |
|------|--|-------------|-------------|----------------------|
| 1933 | 31.0 | 5 | 3 | 60 |
| 1934 | 34.4 | 3 | 3 | 100 |
| 1935 | 33.1 | 3 | 2 | 66 |
| 1936 | 33.2 | 4 | 4 | 100 |
| 1937 | 30.1 | 7 | 3 | 41 |
| 1938 | 27.2 | 8 | 5 | 62 |
| 1939 | 22.4 | 5 | 3 | 60 |
| 1940 | 12.0 | 6 | 2 | 33 |

From a study of these figures it is evident that the highest mortality rates (100 per cent) occurred in the years in which relative to the number of admissions (which have been almost constant at 3,400 to 3,700) the fewest blood

cultures were taken, and conversely the lowest mortality rate (33 per cent) occurred in the year in which relatively the greatest number of blood cultures were taken. It is perhaps more significant that in the first four years covered in this series, staphylococcal septicæmia was diagnosed in 15 patients, of whom 12 died, a mortality rate of 80 per cent, while in the last four years, with approximately the same number of admissions, there was almost the same number of deaths due to staphylococcal septicæmia,¹³ but the number of patients diagnosed rose to 26, and the mortality rate fell to 50 per cent. The number of blood cultures rose from one to 32.9 admissions to one to 22.9 admissions. There have been no radical changes in the method of treatment or in the clinical and laboratory staffs.

It seems probable that, in this hospital, as a result of increased interest in staphylococcal infections, more blood cultures have been taken and more cases of a mild type diagnosed, giving an apparent increase in incidence of the disease and a lowering of the mortality rate.

It is unlikely that this hospital has been unique in this respect, and it may be that the apparent decrease in mortality rate in recent years has been partly due to the increased frequency with which the diagnosis of mild cases is made. Further, the wide range of mortality statistics can be explained to some extent by the fact that the number of mild cases diagnosed has varied in different institutions with the number of blood cultures taken and the technique used. Comparisons of results obtained in different institutions or in the same institution at different periods of time are, therefore, not justifiable.

We have no reliable information regarding the normal mortality rate in staphylococcal septicæmia, and it is probable that no one will ever conduct an investigation using the method of alternate cases. Hence, the problem of estimating the value of therapy is very difficult in this disease. We have attempted in this study to solve it first by determining the underlying factors in prognosis, and secondly by trying to determine whether or not any patients with a poor prognosis have recovered as the result of any form of therapy.

To do this, it was necessary to exclude from the study a number of cases. One group was composed of those whose deaths were "accidental", namely: one child that died as a result of cerebral haemorrhage; one that died as a result of meningeal haemorrhage; and one that

died apparently as a result of a blood transfusion. The other group was composed of cases in which the septicæmia was a terminal event of a chronic disease; in this group there were: two cases of leukæmia, one of atrophic cirrhosis of the liver (diagnosed many months previously), one of congenital subaortic stenosis with bacterial endocarditis, and one of congenital diverticulitis of the bladder, and renal failure. There remained 33 cases on which this study is based; of these 17 died and 16 recovered.

THE INFLUENCE OF A RECENT HEALED STAPHYLOCOCCAL INFECTION OR OF A WELL LOCALIZED INFECTION ON PROGNOSIS

It was felt that if a patient possessed the ability to overcome or to localize a staphylococcal infection, his prognosis with a more severe infection with septicæmia would be better than that of a patient without this ability. In the group that recovered, a bacteriologically proved history of a recent healed staphylococcal infection was obtainable in only one case. This was an infant, admitted with dehydration, vomiting and diarrhoea; he was given continuous intravenous saline by the drip method, and later developed an infection at the site of the intravenous incision, with septicæmia. One week prior to this admission he was discharged from the hospital where he had been treated for a scrotal abscess, which after incision had healed completely; *Staph. pyogenes* was recovered from the pus. This case is particularly interesting because two other infants in the series, both dehydrated and having vomiting and diarrhoea but with no history of a recent healed infection, were infected in the same way. Both these children died, the child with the healed abscess recovered. Three other patients who recovered had well-localized staphylococcal lesions present on admission; one of these had an abscess of the nasal septum; another a localized cellulitis of the neck; the third had a carbuncle which had been traumatized one day prior to admission. Two others had healing furuncles when admitted; no cultures were taken, but the lesions were presumably due to staphylococci; and three survivors gave histories of recent healed infections; one had a blister of the heel which, after discharging for a few days, healed; another had healed and healing impetiginous lesions when admitted; the third had infected scratches of the face which were healed on admission.

Therefore, of the 16 patients with staphylococcal septicæmia who recovered, a history of a recent healed infection, or the presence of healing or well-localized lesions was found in 9; in 7 cases only were such findings absent; although the case histories in the earlier years covered by this report were incomplete.

Of the patients who succumbed, only one had a localized infection on admission. She was a scrofulous child with an abscess of the upper lip draining into the mouth. Her white blood cell count throughout never exceeded 2,500 per c.mm. For many days before she died, the blood was sterile; at autopsy, haemolytic streptococci and *B. pyocyaneus* were found in the heart's blood and lungs, although a staphylococcal cellulitis of the face was present. This child lived 68 days after the probable onset of the septicæmia, a period longer than all but one of the cases in this series.

One patient who died, gave a history of having had numerous boils for the past year. She was given two large doses of unconcentrated anti-toxin intravenously, under an anaesthetic; each dose was followed by hyperpyrexia and a relapse in her condition. She died shortly after the second dose, probably as the result of treatment.

Another patient who succumbed gave a history of an infected mosquito bite which was healed at the time of admission. He survived 86 days after the probable onset of the septicæmia, the longest period in the series. For some time before death, the blood was sterile, but at autopsy numerous staphylococcal abscesses were found in the viscera.

In two fatal cases there were infections which did not heal; one had an infected ulcer of the hand for 6 weeks but no cellulitis; the other had an infected vesicle on the heel and a rapidly spreading cellulitis.

One patient who had had staphylococcal septicæmia some years ago, and who was left with ankylosis of many joints and chronic osteomyelitis, developed an acute flare-up with septicæmia and died.

Hence, 6 patients of the 17 who succumbed had findings suggestive of a recent staphylococcal infection. In 4 of these, ability to localize infection was shown; one died probably as the result of therapy; another was an abnormally poor risk; the remaining two lived 68 and 86 days respectively after the probable onset of the septicæmia, as compared with the average dura-

tion of life of 11 days in the others of the group. The remaining two patients showed no ability to overcome infections.

NUMBER OF ORGANISMS PER C.C. OF BLOOD

The colony counts obtained on blood culture lend some support to the idea that those who recovered were those with some degree of resistance. Of the 16 survivors:

- 1 had no colony count made on admission but the colony count made the following day was 1 per c.c.
- 8 had initial colony counts of less than 1 per c.c.
- 2 had initial colony counts of 2 to 3 per c.c.
- 2 had initial colony counts of 8 to 10 per c.c.
- 1 had initial colony count of 15 per c.c.
- 1 had initial colony count of 20 per c.c.
- 1 had initial colony count of 8 but one taken later the same day yielded 100 colonies and numerous subsequent ones yielded counts of between 20 and 40.

Hence, with two exceptions the colony counts in those that survived were 15 or less per c.c.

The colony counts in those that succumbed were higher on the whole:

- 1 had a colony count of less than 1; this patient had osteomyelitis of the vertebra and meningitis.
- 1 had a colony count of 17, and a history of boils; she died probably as the result of therapy.
- 1 had a colony count of 19, an infected blister of the heel and spreading cellulitis.
- 6 had colony counts between 20 and 100.
- 6 had colony counts of over 500.
- 1 had no colony count, the patient dying before a blood culture was taken, and the diagnosis was made post mortem.
- 1 had no colony count made on the first blood culture. One taken 5 days later yielded 10 colonies and one 8 days later 45 colonies. This patient lived 22 days after the onset of the septicæmia. No history of previous infection was given.

The colony counts in those that died were 19 or over, with three exceptions, of which one had meningitis, another died probably as the result of therapy, and the third had a low initial count that gradually increased.

Complete case reports mentioning either or both of these factors have not been common in the literature in the past few years. The following list includes all cases published between 1938 and 1940 that were found.

A. Colony counts and history of infection given.

- 1. Case of Jacobs and Haas.¹⁰ Female, 18, who developed a vesicle of the heel which after discharging for a few days healed completely; later developed septicæmia (18 colonies per c.c.). She was treated with antitoxin and recovered.
- 2. Case of Wade.¹¹ Male, 34, who had had a boil incised 1 week previously developed septicæmia (30 colonies per c.c.). He was treated with sulfapyridine and recovered.
- 3. Case of E. C. B. Butler²¹ in the course of a discussion, gave short histories of a few cases. A male, 12, who developed a pimple in the nostril, cellulitis of the face, and septicæmia. No initial colony count was made but on the 5th day after admission 140 colonies per c.c. were present. The patient died.

B. History of recent infection, no colony count given.

- 1. Cases of James F. Dowd.¹² (a) Male, 47, had multiple boils of forearm and later abscess of the chest wall and septicæmia. He was given antiserum and later sulfathiazole and recovered. (b) Male, 24, had a flare-up of old osteomyelitis that had been draining for 10 years and septicæmia. He was given antiserum and later sulfathiazole and recovered.

- 2. Case of Herbert M. Packer.¹³ Male, 38, developed an abscess of the jaw and septicæmia following a tooth extraction. He was given autogenous vaccines and later antitoxin and recovered.

- 3. Case of Goldberg and Sacks.¹⁴ Female, 2½, developed septicæmia after injuring a carbuncle. She was given sulfanilamide and later sulfapyridine and she recovered.

- 4. Case of Florence S. McConney.¹⁵ Female, 31, developed cellulitis of the face and septicæmia. She was treated with prontylin and recovered.

- 5. Case of O'Brien and McCarthy.¹⁶ Female 34 who had been having numerous boils, developed whitlow and septicæmia. She was given sulfapyridine and recovered.

- 6. Case of Fenton and Hodgkins.¹⁷ Male, 35, developed an abscess 2 months prior to admission; 6 weeks later the abscess healed; later he developed septicæmia. He was treated with sulfapyridine and recovered.

C. Colony counts but no history of previous infections given.

- 1. Joyner and Smith⁶ discussing their series of cases, gave detailed histories of 3 patients; one had a colony count of 3 and recovered; another had a colony count of 5 and recovered; the third had a colony count of 20 to 40 and succumbed.

- 2. Baker and Shands⁴ in their series had no recoveries in their "untreated" group with more than 10 colonies per c.c. and in the group with 10 colonies per c.c. or less there were 9 recoveries and 5 deaths in the untreated series and 15 recoveries and 1 death in the treated series. This series will be discussed in more detail later.

- 3. Case of Ward J. MacNeal.¹⁸ Cites a case of a boy of 15 who 2 days after suffering an abrasion developed septicæmia (1,000 colonies per c.c.) and endocarditis, and died.

D. Colony counts given, local infection present, but the presence or absence of localization could not be determined.

- 1. Case of Thomas S. P. Fitch.¹⁹ Female, 10, had an infected bruise of the hip for 5 days before developing an epidural abscess and recovered.

- 2. Case of O. H. Lehman.²⁰ Male, 12, had an infected laceration for 6 weeks, then developed osteomyelitis and septicæmia (70 colonies). He was given staphylococcus antitoxin and sulfapyridine and recovered.

- 3. Case of E. C. B. Butler.²¹ Female, 62, who had pricked her finger 5 days previously. Blood culture was positive (5 colonies on the 21st day). The finger was amputated and the patient was given sulfanilamide and later sulfathiazole. The blood culture became negative but the patient died during convalescence of cardiac failure.

The above cases are selected ones. Numerous other cases have been published of which the following are examples.

- 1. Seven cases published by Sutherland in 1940 were a collected group of superficial infections with septicæmia, occurring over a period of seven years; no colony counts were given, nor was the local condition described except by the words furuncle or blister. The same is true of a series of 6 cases of carbuncle of the face with two recoveries, given by Abramson and Flasks in 1939. MacNeal¹⁸ described two other cases with local infections

with one recovery; Mendell in 1939 reported 6 cases with carbuncles, with one recovery, and 4 cases with abscesses or furuncles with one recovery; Mitchell and Chapman in 1940 reported 20 cases with primary skin lesions with 5 recoveries; these, too, were not described in detail and they cannot therefore be included.

The published cases reviewed above do not give enough information to show a clear relationship between colony count and death or recovery. Other factors may influence the demonstration of such a relationship, such as age of patient, period of taking blood cultures and the technique employed. Our series is confined to children of 13 years and under, while the other cases are of all ages. Variations in techniques employed in different laboratories would probably result in varying colony counts. In our laboratory, for example, the plates are discarded as soon as the diagnosis is made and hence our counts may tend to be low. So far as the influence of recent healed or localized infections is concerned, the published cases reviewed appear to support our own findings.

The experimental evidence with regard to the effect of previous staphylococcal infections on a subsequent one is scanty. Panton and Valentine²² found that in rabbits repeated intradermal injections of staphylococci gave rise to hypersensitivity, in that such animals were infected by much smaller doses of bacteria than the controls; large doses, however, produced smaller lesions than in controls and large intravenous doses failed to produce death, or if death did result, it occurred late; that is, animals that had received repeated doses of staphylococci were rendered more susceptible to infection, but the infection was more readily overcome. This work has not been repeated so far as we know.

Rodet and J. Courmont (1891) (quoted in *Precis de Bacteriologie*, 3^o Edition, P. Courmont) found that filtrate of staphylococcus cultures when injected into rabbits predisposed them to a more severe infection than untreated rabbits; this predisposing substance was alcohol soluble and alcohol extracts gave the same effects.

A factor in prognosis not previously mentioned but which is emphasized by many is the type of local disease associated with the septicaemia. Osteomyelitis in particular is considered to be distinct from other infections.

Table I shows that in osteomyelitis with "untreated" septicaemia the mortality rate varies from 38 to 70 per cent. In our series, there were 17 cases of whom 8 died (47 per cent), a figure moderately lower than the crude death rate of 61 per cent.

THE EFFECT OF THERAPY

With few exceptions the prognosis of the individual patient in this series was predetermined by (a) the colony count; (b) the presence or absence of a history of a recent healed staphylococcal infection, or, the presence or absence of localization in an existing staphylococcal infection.

The above criteria did not apply to certain cases and these must be considered in more detail. Such were:

(a) A patient with a traumatized carbuncle had an admission colony count of 8, later the same day it was 100; the following day it was 20 and it varied between 20 and 40 until it suddenly became negative. He received between the 2nd and 4th day of his illness 80,000 units of staphylococcus antitoxin and sulfathiazole; between the 5th and 7th he was given 180 c.c. of Julianelle's antiserum and between the 8th and 13th day, 160,000 units of antitoxin and sulfathiazole. He recovered.

(b) A patient who had had infected mosquito bites of the face was admitted with a colony count of 35. He was given 150,000 units of antitoxin between the 5th and 15th day of his disease. His blood culture became negative at the end of two weeks and remained so. He died on the 86th day; lung abscesses were present at autopsy.

(c) A patient with scurvy and with an abscess of the upper lip, had an initial colony count of 1,000. She was given sulfathiazole. Her blood culture became negative but she died on the 68th day; staphylococcal cellulitis was present at the time of death, but only haemolytic streptococci and *B. pyocyanus* were found in the heart's blood at autopsy.

These three patients had high colony counts and either localized staphylococcal infections or histories of healed infection, possibly staphylococcal. The prognosis therefore was doubtful, and this was confirmed by the clinical course. It is possible that the intensive treatment given the first patient was responsible for his survival.

(d) A patient who had no history of recent infection, had a colony count of 20 on admission, subsequent cultures showed a reduced number and a count of only 1 colony per c.c. persisted for some time prior to the beginning of antitoxin administration. From the eighth to the tenth day of his illness, he received 25,000 units of antitoxin. He recovered, despite the apparently poor prognosis, although he died a few years later of rerudescence of the infection. Since the colony count dropped from 20 to 1 before serum therapy was begun, it is questionable whether the serum played any rôle in his recovery from his initial infection.

Therapy, therefore, has resulted in saving the lives of possibly two individuals who might otherwise have died, but it failed to change the course of events in any other patient.

The therapy employed, other than the necessary surgery was variable, and is shown in Table III.

TABLE III.
DIED

| | Number of cases | Colony counts |
|--|--------------------|--|
| Antitoxin..... | 8 | 800, 50, 30, 19, 17, (-1), N.C., N.C. |
| Antitoxin, sulfanilamide.. | 3 | 1500, 60, 53. |
| Antitoxin, sulfapyridine.. | 1 | 100. |
| Antitoxin, sulfathiazol.... | 0 | |
| Sulfanilamide..... | 0 | |
| Sulfathiazol..... | 2 | 1000, 17. |
| Antitoxin, sulfathiazol, Julianelle's serum.... | 0 | |
| No specific treatment.... | 3 | 1000, N.C., N.C. |
| Total..... | 17 | |

SURVIVED

| | Number of cases | Colony counts |
|--|--------------------|----------------------------|
| Antitoxin..... | 2 | 20, 1. |
| Antitoxin, sulfanilamide.. | 1 | (-1). |
| Antitoxin, sulfapyridine.. | 0 | |
| Antitoxin, sulfathiazol.... | 1 | 2. |
| Sulfanilamide..... | 2 | 8, 3. |
| Sulfathiazol..... | 4 | 15, 15, (-1), (-1). |
| Antitoxin, sulfathiazol, Julianelle's serum.... | 1 | 100. |
| No specific treatment.... | 5 | 1, (-1), (-1), (-1), (-1). |
| Totals..... | 16 | |

It is apparent that antitoxin was used almost routinely in those who succumbed, and but rarely in those who survived. The three patients who died without receiving any therapy, succumbed within a few hours of admission. The amount of antitoxin used, depended in general on the duration of life after the diagnosis was

established: 6 patients who lived 10 days or less received an average of 20,000 units each; 2 who lived 11 to 15 days received an average of 50,000 units each; 3 who lived 16 to 20 days received an average of 73,000 units each; 2 who lived over 20 days received an average of 85,000 units each.

Our cases, therefore, offer no convincing evidence that either drugs or sera are of appreciable value in therapy, and we think that with some exceptions the improvement in mortality rate obtained by others is more apparent than real. Referring to Table I, it is seen that the death rate in "untreated" cases varies from 61 to 91 per cent, most series having from 70 to 85 per cent. The rates obtained with bacteriophage were 47 to 75 per cent, while those with antitoxin varied from 38 to 55 per cent. The uncorrected death rate in our series was given at 61 per cent, but in the first four years covered it was 80 per cent, and in the last four it was 50 per cent. As we feel that our death rate has been little affected by treatment, it is probable that a mortality of 50 per cent is to be expected in institutions where a greater number of blood cultures are taken and hence a larger number of the less severe cases are discovered.

Two published series require further consideration. That of Baker and Shands⁴ is based on 65 cases; only 9 of the 35 patients given antitoxin died, while 21 of the 30 controls failed to survive; the authors state that in the 9 patients given antitoxin who succumbed, there was insufficient drainage in 5, inaccessible foci in 2, and pneumonia in 2. The authors describe the technique used in detail; here it is only necessary to state that they control the amount of antitoxin used by skin tests, and that in the first four hours 60,000 to 100,000 units are given, and then 40,000 to 60,000 daily as long as is necessary. The large amounts given early in the disease is in marked contrast to that given in our series.

The other significant series is that of Julianelle.⁹ He used in treatment antiserum prepared from staphylococci containing type A carbohydrate. In 17 patients, he had 11 deaths; these comprised: 1 death from pericardial haemorrhage; 1 death from type 8 pneumonia; 1 death from arsenic poisoning; 1 death from sulfanilamide leukopenia; 2 deaths within 24 hours of admission.

The clinical value of the sulfonamide group is yet to be determined; only isolated cases and

short series have been published. The same is true of the arsenicals advocated by Osgood.²⁶

EXPERIMENTAL FINDINGS

It is not possible to review in detail the present conceptions on staphylococci and staphylococcal immunity. Certain points however are of clinical interest.

Pyogenic staphylococci produce a number of substances, certain of which may be mentioned. (1) Toxin. This is formed by all pathogenic strains, but the virulence of the organism is not determined by the amount of toxin produced; some strains of low virulence are highly toxicogenic and vice versa. The toxins are complex, but three factors, the haemolytic power for rabbit red blood cells (alpha haemolysin), the dermonecrotic power and the lethal power seem to parallel one another. The toxin is antigenic and the antitoxin protects rabbits against lethal doses of toxin but it does not consistently protect them against lethal doses of staphylococci, although the life of those that succumb is usually prolonged; nor does the antitoxin prevent the formation of local lesions in those given sublethal doses of the organism. Various observers, *e.g.*, Kitching and Farrell, Rigdon, Smith, have stated that the resistance of rabbits to infection varies directly with the amount of antitoxin present. It seems probable that, although antitoxic immunity is an important factor in overcoming a staphylococcal infection, it is not the only one. (See Rigdon²⁷ for a review of staphylococcal toxin and antitoxin.)

2. Leucocidin. This also is antigenic. It destroys white blood cells *in vivo* and *in vitro* and repeated injections in animals give rise to leukopenia. Valentine and Butler²³ state that the amount of antileucocidin produced varies with the severity of the illness and, according to Cowan, the antileucocidin titre was not a measure of immunity.

3. Other factors. Cowan²⁸ found that vaccines prepared from staphylococci gave rise to high agglutin titres and a definite degree of immunity, although the agglutin titre and immunity did not parallel one another. Similar protection was afforded by a pasteurella vaccine, and the writer felt that the immunity therefore was a non-specific one. Farrell and Kitching²⁴ using antibacterial horse sera, found that homologous sera were more protective than heterologous ones in mice, and concluded that the protection was due to some unidentified

antibody. The work of Valentine and Butler²³ was mentioned previously. Finally, Julianelle,⁹ working on the basis of carbohydrate content, divided staphylococci into two groups, one of which, Type A, was pathogenic: rabbit sera prepared to obtain a high titre of Type A antibodies was found to give considerable protection against staphylococci in both animals and men.

The value of the sulfonamide drugs in therapy has been the subject of numerous investigations.²⁵ Sulfanilamide is said to have no appreciable effect. Sulfapyridine and sulfathiazole seem to prolong life; the latter being apparently more effective.

To summarize the experimental findings, there is no doubt that pathogenic staphylococci produce potent toxins; clinical cases should therefore be given sufficient antitoxin to neutralize all toxin as formed. The amount given must be controlled either by skin tests or by titrations so that an excess is always present; this should at least prolong life, if rabbit experiments are analogous to human infections. However, other factors besides toxin are involved in staphylococcal infections, and evidence supporting the value of antibacterial sera cannot be disregarded. Experimental findings suggest that a serum high in antibacterial qualities (high anti Type A carbohydrate titre?) and high in antitoxin would be of value. The sulfonamide drugs, especially those of the sulfathiazole group, though not curative, prolong life in experimental animals and may tend to do so in man, if used in full doses.

SUMMARY

It is suggested that some of the recent improvement in mortality rate in staphylococcal septicæmia is the result of more frequent diagnosis of mild cases, and that, depending upon conditions, there is likely to be a considerable variation in the percentage of deaths in different institutions. To overcome this, a possible basis of prognostication in individual cases was found that was with rare exceptions applicable to the cases in our series. Patients with a history of recent healed staphylococcal infections or having well-localized infections and low colony counts on blood culture were found to survive; those with no such history or with spreading infections and high colony counts succumbed. Those in which the history

of localization and the colony counts were contradictory formed an intermediate group, which either survived, or whose death was delayed. In our series, the lives of 2 patients were possibly saved by treatment. A review of recently published cases is given; these seem to support our findings both as regards prognosis and treatment. Two series of cases, in one of which antitoxin and in the other anti type A bacterial serum was used, are mentioned for their apparently encouraging results. The experimental value of antitoxin, antibacterial serum, and sulfonamide drugs is discussed and it is suggested that these be combined in therapy in human disease.

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RÉSUMÉ

L'amélioration du taux de mortalité dans la septicémie staphylococcique est dûe au fait que les cas légers sont diagnostiqués plus fréquemment. Les variations de la statistique sont imputables à la provenance des cas rapportés et à la thérapeutique mise en œuvre. On peut arriver à standardiser la manière de voir au sujet des staphylococcémies. Dans notre série, les malades avec histoire d'infections staphylococciques récemment guéries, ou d'infections bien localisées et dont les cultures révélaient très peu de colonies ont survécu; ceux qui ne présentaient pas de telles histoires, ceux dont l'infection était rapidement envahissante et dont les cultures révélaient de nombreuses colonies ont succombé. Les cas intermédiaires ont ou bien survécu, ou bien succombé après un délai plus ou moins long. Dans notre série, deux malades ont probablement survécu à cause du traitement. La revue des cas récemment publiés semble donner crédit à notre manière d'envisager le pronostic et le traitement. Les résultats sont assez encourageants chez les malades qui ont reçu l'antitoxine d'une part, et d'autre part, chez ceux qui ont reçu le sérum bactérien anti-type A. A ces agents thérapeutiques la clinique humaine bénéficie très probablement de l'adjonction des sulfamidés.

JEAN SAUCIER

BRONCHIECTASIS*

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IN this review of the subject of bronchiectasis I shall discuss first briefly its etiology and pathology, and then more fully the diagnosis, prognosis and treatment.

Bronchiectasis is a dilatation of one or more branches of the bronchial tree, which sooner or later become infected. That is, there may be anatomical bronchiectasis without infection, and clinical bronchiectasis when infection supervenes. The causes of this disease are still indefinite. They have always been divided into congenital, and acquired or secondary. Some have doubted the existence of true congenital bronchiectasis, but there does seem to be a moderate amount of evidence supporting an anatomical bronchiectasis at least.

The secondary factors are divided usually into intrinsic, such as bronchitis, or narrowing of the lumen by foreign body or pressure, and extrinsic, such as tuberculosis, pleural effusion or sinusitis. In his recent excellent book on "Diseases of the Chest", Davidson³ supports the contention that collapse of the lung is the primary factor in the production of bronchiectasis. The bronchi become blocked with mucus, the portion of the lung involved collapses, and the local bronchi in that area dilate. The process is reversible in some cases, clearing of the bronchi being followed by aeration of the lung and return of the dilated bronchi to their normal size. The temporary or reversible bronchiectasis might be considered anatomical only, and the persistence of the condition with the introduction of inevitable infection would exemplify clinical

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bronchiectasis. In such a course of events fibrosis of the lung parenchyma would be a sequel to the bronchiectasis rather than an antecedent.

The pathological changes in bronchiectasis naturally vary with the intensity of the disease. The typical well developed cavities in the bronchial tree, filled with pus, with thin bronchial walls and fibrosed parenchyma are familiar to all. The disease process seems to start in a single small area and to spread to adjacent areas. The lower lobes are involved much more commonly than the upper, and the sides about equal in frequency. The appearance of the dilatations has been classified as cylindrical, fusiform, or saccular, but this again seems to be merely a difference in the degree. There is a definite incidence of malignancy, about 10 per cent, in all cases of bronchiectasis, so this must be remembered in the diagnosis and treatment. Besides the local changes in the lung general pathological conditions are seen secondary to the bronchiectasis. These include dilatation of the right side of the heart with its sequelæ, amyloid disease, especially in the kidneys and spleen, and local suppurations, as in brain abscess and meningitis, curiously enough seen in about 13 per cent of cases. Less dramatic but equally serious are the general loss of strength, weight and resistance, due to the persistence of the suppurative process in the lung.

As in every disease the diagnosis is made by the correlation of symptoms and signs, and the results of any special investigations; in bronchiectasis the symptoms are important, the signs are usually few, and the diagnosis is established radiologically after outlining the bronchial tree with lipiodol. The characteristic symptoms are cough and sputum. In the early stages there may be only a harassing cough, persisting and increasing with each recurrent acute infection until cavities are established, in which the secretions collect and stagnate. Then sputum will be produced, the amount and odour depending on the size of the cavities and the variety of the infecting organisms. The typical paroxysms of coughing are brought on by change of position, as on rising in the morning, lying down at night, or bending over to tie a shoe. The cough impulse is due to overflow from the cavities irritating the more normal bronchial mucosa higher up, and is only relieved by emptying the cavities. The sputum varies with the intensity of the disease and the characteristic sputum which

settles out in three layers is seen only in the fairly far advanced cases. Other symptoms such as dyspnoea and pain in the chest depend on the extent of the involvement of the lung or of the pleura. They are actually seen rather rarely, and the other sign of haemoptysis may be a sudden profuse one, or much more commonly is merely a pink tinge of the sputum.

The different ways in which these manifestations appear and develop are very interesting, and their study may be of considerable value in diagnosis. Davidson groups the onset and clinical picture in four main categories. There is the slow insidious cough with sputum, which gradually increases until bronchiectasis is present and recognized; there is the type which dates definitely from an acute respiratory lesion such as pneumonia or massive collapse; bronchial obstruction, rapidly, by a foreign body, or, slowly, from external pressure is another etiological group; lastly, are those cases with intermittent haemoptysis, separated by intervals relatively free of symptoms. The first two types account for the majority of cases of bronchiectasis, and in our series of operable cases at the Toronto Western Hospital, only two fell in the group with insidious cough of long duration, as most of them had a definite history of pneumonia on one or more occasions, followed by a chronic cough. This supports Davidson's suggestion that bronchial obstruction by mucus during an acute infection is a prime etiological factor.

With regard to the physical signs found in bronchiectasis, the interesting feature is the slight positive findings considering the extent of the disease. Naturally, they do vary with the seriousness of the condition, but even the most extensive give relatively few signs. Dullness to percussion, diffuse or local râles, occasional rhonchi, areas of bronchial breathing, or decreased air-entry, signs of cavity, either full of fluid or empty, any one or all of these may be the local physical signs. General signs include emaciation, myocardial hypertrophy, and clubbing of the fingers. A regular x-ray of the chest frequently reveals little of value in the making of a diagnosis. The one method of investigation that is most helpful, and that has been responsible for the establishment of the definite diagnosis of bronchiectasis, is bronchography. This visualization of the bronchial tree was first done as long ago as 1905, but the present use of lipiodol was only begun in 1922. By means of this radiologically opaque oil the whole bron-

chial tree can be outlined, and the extent and localization of disease determined. There are three chief methods of introducing lipiodol. The simplest is the dropping of the warm oil just behind the root of the tongue on the side of the pharynx on which the oil is to run down. If the patient breathes quietly and does not cough or swallow, the oil runs into the bronchial tree and outlines it very satisfactorily. The upper lobes may be visualized by quickly getting the patient on his side, and tilting the head down. If the pharynx cannot be sufficiently desensitized, or if the patient does not co-operate, the oil may be injected directly into the trachea through the crico-thyroid membrane, following cocaineization of the tracheal mucosa. The third method is the introduction of lipiodol into the suspected area following bronchoscopy. As I believe bronchoscopy should always be done on every suspected case of bronchiectasis, this method of bronchography may become very satisfactory. The most efficient way of injecting the oil is by ureteral catheter which is introduced directly into the suspected branch bronchus and left there after removal of the bronchoscope, the oil being run in on the x-ray table.

The prognosis in the case of bronchiectasis must be considered from several different aspects. There is first the life-expectancy of the patient, and the effect on the physical health. The disease may go on for years in a relatively mild degree, and the danger to life is generally speaking much less than in pulmonary tuberculosis. On the other hand there is a very definite tendency for it to increase in severity, and there is always an increased susceptibility to recurrent acute pulmonary infections. Besides a chronic suppurative condition is present which gradually breaks down the patient's general health. Before active surgical treatment was undertaken in this disease a series of 100 patients was followed carefully. There is no record of how long each had the disease, but of these 34 died of bronchopneumonia, and 34 of general exhaustion.

The effect of bronchiectasis on the patient's mental health and social activities must also be considered. As Churchill suggests, this is a disease of youth and early adult life which exerts its influence on body and mind during the formative period. There is a reluctance to appear at social gatherings; there may be interruptions at school or work by recurrent acute respiratory attacks; there may be constant fatigue, with inability to plan or consider a

career, marriage or childbirth; and there may be a constant fear of haemorrhage.

From the other point of view, what can we offer in the way of active treatment and its results. Let us consider only the operation of lobectomy. The operative mortality has decreased so considerably that now several centres can report rates of 2, 3 or 4 per cent over a period of five or six years. Of those surviving operation Churchill has estimated a complete cure in 85 per cent, and a definite improvement in all. Our own results compare favourably with this, having secured a complete cure in 80 per cent of those operated on. This means that four patients out of five suffering from bronchiectasis may be cured by undergoing an operation with a mortality of less than a stomach or colon resection.

In discussing the various methods of treatment of bronchiectasis it is usual to divide them into medical and surgical. The medical ones may be used alone in those cases in which no type of surgery is indicated, or they may be used in conjunction with the lesser surgical procedures, or as pre-operative measures in lobectomy or pneumonectomy. In other words, medical treatment is always important, and if it is pre-operative, so much the better. The importance of rest, fresh dry air and sunshine cannot be stressed too much. Sudden changes of environment or climate should be avoided, as a means chiefly of cutting down the incidence of acute respiratory infections. The general health must be built up by diet, tonics and regulated exercise. The large cavities in the lung must be kept as empty as possible. This is accomplished by postural drainage which may be either intermittent at regular times during the day, or continuous, which means confinement to bed, with the head considerably lower than the feet. This latter method is particularly valuable as a pre-operative measure. There have been a number of reports recently of the value of the inhalation treatment of bronchiectasis. This involves inhaling of certain gases continuously for varying periods of time. Unfortunately I have been unable to obtain authentic results of any considerable number of cases treated in this way.

Of the various surgical procedures used in the treatment of bronchiectasis brief mention may first be made of pneumothorax, phrenicotomy and thoracoplasty. These attempts to collapse the lung, and so to empty and collapse the bronchiectatic cavities, have been on the whole

disappointing. They may be helpful in very early cases, when there is relatively little infection, or they may decrease the amount of sputum and secondarily improve the patient's general condition. But in the great majority of instances collapse therapy has been of little value, and in our experience has been more a detriment than a help. Bronchoscopic drainage may be beneficial, chiefly in assisting efficient postural drainage, but it can never be considered a satisfactory treatment alone, and certainly has little or no effect on the progress of the disease. By process of elimination we finally come to the logical surgical treatment of disease, that is, the removal of the diseased tissue. Lobectomy and pneumonectomy have assumed an established position in the treatment of bronchiectasis, chiefly for reasons explained in the discussion of prognosis. Indications for operation are the definite presence of bronchiectasis localized to an area or areas that can be removed without seriously endangering the vital capacity. The general condition of the patient must be such that he will undergo a major surgical procedure reasonably well. In this, age is important, young adults having little trouble, and those over 50 years of age suffering considerably. The amount of diseased lung that can be removed is gradually increasing. The usual operation is removal of one lower lobe. Both lower lobes have been removed successfully on numerous occasion, and one whole lung may be removed.

Technically, the operation of lobectomy is not a particularly difficult one. We have been using intracheal ether or cyclopropane for anaesthesia, having previously emptied the cavities as well as possible by postural drainage. The incision used is a postero-lateral one, paralleling the scapula, and the chest is opened by separating two ribs whose vertebral ends have been cut. The most time-consuming factor is the separation of the adhesions, which vary considerably in each case. When the lobe is sufficiently free the tourniquet is applied close to the hilum and the lobe removed distally, leaving sufficient stump to allow firm ligature of the vessels and oversewing of

both vessels and bronchus. We have used the lung tourniquet in all cases, although in some centres now they are finding dissection and individual ligation of the hilar structures satisfactory. If possible the stump may be buried in adjacent lung or covered with parietal pleura; then closed drainage is established through a space or two below the incision and the wound closed firmly. Transfusion and the oxygen tent are of great assistance in the immediate post-operative care. If the upper lobe expands quickly, and if there is little fluid in the pleural cavity, as is usually the case, the tube may be removed on the fourth day, and continued progress is seen. Complications of empyema and broncho-pleural fistula are seen quite commonly, but their seriousness is considerably lessened by the expansion of the upper lobe, and most of them will clear up fairly rapidly when adequately treated.

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RÉSUMÉ

Les causes de la bronchectasie sont mal définies. Il existe une bronchectasie anatomique, congénitale, non consécutive à une infection. Les bronchectasies secondaires suivent les bronchites, la tuberculose, les pleurésies avec épanchement et les sinusites. Le collapsus pulmonaire amènerait aussi le bronchectasie par dilatation secondaire. L'anatomie pathologique varie avec l'intensité de la maladie; les parois sont amincies et le parenchyme est fibreux. Les lobes inférieurs sont les plus souvent atteints. Secondairement, le cœur droit est souvent dilaté, les reins et la rate subissent parfois la dégénérescence amyloïde, et il peut exister des suppurations essaimant à distance. Le diagnostic est surtout fait par les radiographies, une toux et une expectoration très caractéristiques, avec paroxysmes lors des changements de position, parfois par l'hémoptysie. Le mode de début et le tableau clinique peuvent varier dans leurs manifestations, mais l'image bronchographique lipiodolée est toujours caractéristique. Le pronostic est réservé à cause de l'épuisement de l'état général et de l'extension du processus. La lobectomie est le traitement de choix puisqu'elle guérit plus de 80 pour cent des cas. Le traitement médical peut parfois amener la guérison et doit être tenté avant l'opération. Le pneumothorax, la phrénoctomie et la thoracoplastie ont donné des résultats peu encourageants.

JEAN SAUCIER



CORONARY DISEASE AND OCCUPATION*

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FROM the standpoint of vital statistics coronary disease is a new phenomenon. As a matter of fact, it is a relatively new phenomenon from the standpoint of internal medicine. Angina pectoris has long been recognized as being usually associated with disease of the coronary arteries, but thrombosis of the arteries as a clinical disease has only recently become a commonly diagnosed condition. Herrick¹ is credited with having first drawn attention to coronary thrombosis as a condition which does not necessarily cause death. This was in 1912, but the rank and file of the medical profession paid little attention to his observations until well after 1920. It was not until 1930 that a reorganization of the classification of heart disease to include coronary thrombosis occurred in the International List of Causes of Death. Prior to 1930 there was no separate classification of diseases of the coronary arteries. Angina pectoris was classified separately, it is true, but since 1930 coronary disease has been listed under International No. 94 as (a) Diseases of the Coronary Arteries, (b) Embolism and Thrombosis of the Coronary Arteries and (c) Angina Pectoris.

TABLE I.
DEATHS FROM CORONARY DISEASE AND ANGINA PECTORIS
BY SEX, CANADA, 1931-1938.

| | Male | Female |
|-----------|-------|--------|
| 1931..... | 1,937 | 923 |
| 1932..... | 2,530 | 1,129 |
| 1933..... | 2,840 | 1,308 |
| 1934..... | 3,276 | 1,457 |
| 1935..... | 3,578 | 1,735 |
| 1936..... | 4,020 | 1,940 |
| 1937..... | 4,551 | 2,120 |
| 1938..... | 4,978 | 2,271 |

It is not surprising, therefore, that coronary disease shows what appears to be an enormous increase. Table I shows the record of mortality from diseases of the coronary arteries and angina pectoris in Canada since 1931, according to sex.

One gains the impression that even this rather formidable array of deaths represents

an understatement rather than an overstatement of the actual picture, for it is common knowledge among clinicians that many cases of coronary disease are still undiagnosed and confused with disease of the stomach or gall bladder or nervous system.

It does not seem possible at this time to settle the question whether coronary disease is on the increase or not. Vital statistics will not give the answer, for if we are to rely on them we find that the incidence of coronary disease is nearly three times as high in Canada and the United States as in England, a very unlikely situation. It is of interest to note, however, that in Canada, since 1931 the whole increase in recorded deaths from heart disease can be accounted for by an increase in deaths due to coronary disease. Undoubtedly there has been a reshuffling of diagnoses within the general heading of heart disease, so that it would be improper to say that only coronary disease has been responsible for the increase in recorded deaths from heart disease. But it is also probably true that a number of deaths which 15 years ago would have been ascribed to some other cause are now correctly diagnosed as coronary thrombosis and recorded as heart deaths, thus swelling the cardiac record and diminishing the record for some other disease.

Dr. F. P. Denny,² the Health Officer of Brookline, Mass., took the trouble a few years ago to reclassify according to the 1930 International Classification, the causes of all deaths from heart disease occurring in Brookline since 1900. His figures show a mortality from angina pectoris of 16.7 per 100,000 in 1900-1904 and no mortality at all from coronary thrombosis. By 1935 the angina pectoris rate had risen slightly to 21.8 per 100,000, while the rate for coronary thrombosis was 156.6. Denny believes that there has been unquestionably an increase in deaths from coronary disease. In Brookline in 1935 the rate for coronary disease was greater than the rate for all forms of heart disease in 1900. If the rate for coronary disease in 1935 had occurred in 1900 there would not have been any deaths at all from other forms of heart disease, assuming, of course,

* From the Department of Public Health and Preventive Medicine, Faculty of Medicine, McGill University.

that all the coronary deaths in 1900 were diagnosed as deaths from some other form of heart disease, an assumption which is quite unlikely.

Men with long clinical experience in heart disease, like Paul White, feel that angina pectoris is certainly on the increase. But Meakins and Eakin³ in a study of 62 fatal cases of coronary occlusion which occurred in the Royal Victoria Hospital, Montreal, over a period of 35 years found that the ratio of cases to autopsies was in 1896 to 1900 1 to 110 and in 1926 to 1930 1 to 79. The difference is not significant considering the small number of cases. Levy and others⁴ report that the autopsy diagnosis of coronary disease at the Presbyterian Hospital, New York, was made in 17.8 per cent of autopsies in 1910 to 1919 and in 30.4 per cent of autopsies in 1920 to 1931. This increase is not necessarily significant since in all probability pathologists have been looking for the disease more carefully in recent years. In statistics obviously any new disease will show an increase. The death rate from diabetes has increased markedly since the discovery of insulin.

From the public health or epidemiological standpoint a consideration of great interest is whether coronary disease can be ranked as an occupational disease. Of angina pectoris White says "(it) is encountered more in communities where the strain of life is great and a hurried existence a habit",⁵ and of coronary thrombosis "one has the definite impression that it is distinctly less common in the lean labourer or farmer".⁶

So far as I am aware no figures are available on this side of the water which would enable one to calculate the occupational incidence of coronary disease. Certain suggestive data are published. From the standpoint of sex, for example, it is well known that coronary disease attacks males more than females. The incidence is about twice as great. Table II gives the figures in Canada for the years 1934 to 1938.

TABLE II.
DEATHS AND DEATH RATES FROM CORONARY DISEASE,
CANADA, 1934-1938.

| | <i>Males</i> | <i>Females</i> |
|---|--------------|----------------|
| Estimated population, 1936..... | 5,796,845 | 5,374,100 |
| Deaths from coronary disease, 1934-1938..... | 20,403 | 9,523 |
| Average annual death rate per 100,000..... | 70.4 | 35.4 |

It is almost entirely on account of the excess mortality from coronary disease that the male death rate from heart disease is so much higher than the female.

From the standpoint of colour we have to go to the United States for statistical evidence. Some writers think that angina pectoris is extremely rare among negroes. Roberts⁷ says that in 20 years' experience among sick negroes both in in- and out-patient departments he has never seen a case in a negro. He quotes other writers more or less to the same effect. Statistically both angina pectoris and coronary thrombosis seem to attack the coloured race less frequently than the white. According to the experience of 1938 the relative mortality of persons over 40 years of age, standardized for age is approximately as shown in Table III.

TABLE III.
PROPORTIONAL MORTALITY FROM CORONARY DISEASE,
STANDARDIZED FOR SEX AND COLOUR,
UNITED STATES, 1938.

| | <i>White males</i> | <i>White females</i> | <i>Negro males</i> | <i>Negro females</i> |
|---|------------------------|--------------------------|------------------------|--------------------------|
| Angina pectoris..... | 100 | 41.4 | 69.0 | 62.2 |
| Coronary disease.... | 100 | 43.7 | 36.8 | 29.1 |
| Angina pectoris and coronary disease.. | 100 | 43.4 | 40.7 | 32.2 |

In the above table rates per 100,000 are not given, since the 1930 population figures were used instead of the calculated 1938 populations. It will be seen from these figures that there is no justification for the statement that angina pectoris and coronary thrombosis are rare among negroes. They are, however, substantially less evident.

The Metropolitan Life Insurance Company publishes monthly its experience among its industrial policyholders. This group of insured persons, paying insurance premiums on a weekly basis, constitute a good cross section of the wage earning population of the United States and Canada. The ordinary insurance group represent a much higher economic classification. The experience of the Company is shown in Tables IV and V.⁸

At the Massachusetts General Hospital, according to Gordon, Bland and White,⁹ 24 per cent of the private patients in the age group 40 to 60, examined post-mortem, were found to have acute coronary occlusion or myocardial infarction, only 12.2 per cent of ward patients were so affected.

TABLE IV.

DEATH RATES PER 100,000 FROM ANGINA PECTORIS AND CORONARY DISEASE AMONG THE INDUSTRIAL AND ORDINARY POLICYHOLDERS, METROPOLITAN LIFE INSURANCE CO., 1930 AND 1935.

| | Industrial Policyholders | Ordinary Policyholders |
|---|--------------------------|------------------------|
| Coronary disease only, 1930.. | 4.7 | 8.5 |
| Coronary disease only, 1935.. | 22.6 | 28.8 |
| Coronary disease and angina pectoris, 1930..... | 14.1 | 24.5 |
| Coronary disease and angina pectoris, 1935..... | 31.8 | 43.0 |

TABLE V.

DEATH RATES PER 100,000 FROM ANGINA PECTORIS AND CORONARY DISEASE ACCORDING TO SEX AND COLOUR, INDUSTRIAL POLICYHOLDERS, METROPOLITAN LIFE INSURANCE CO., 1935.

| | |
|-----------------------|------|
| White males..... | 48.7 |
| White females..... | 19.3 |
| Coloured males..... | 24.0 |
| Coloured females..... | 18.3 |

Hedley,¹⁰ in an analysis of 5,116 deaths reported as due to coronary occlusion in Philadelphia, calculated the occupational mortality per 100,000 as 154 for professional men, 140 for proprietors, managers and officials, 128 for clerks and salesmen, and 107 for workers (all-classes) at ages 35 to 64.

Masters, Dack and Jaffe,¹¹ however, in a study of 1,700 proved attacks of coronary thrombosis produce figures which appear to be at variance with the above; 35.5 per cent of their cases were manual workers, 19.5 per cent housewives, 11 per cent business men, 10 per cent retired, 9.5 per cent white collar, 9 per cent professional workers, and 5.5 per cent store workers. This distribution, they say is almost identical with the general population of New York City.

Probably the most precise occupational mortality figures available are those published decennially by the Registrar-General of England and Wales. The latest publication deals with the experience in the years 1930 to 1932,¹² which coincide with the change in the International List to include coronary disease as a separate classification. The Registrar-General has given the mortality by ages in many occupational groups and has also grouped the occupied and retired population into 5 major social groups in a descending economic scale. Group 1 represents the highest economic class and group 5 the lowest. Table VI gives the death rates per 100,000 at various ages over 45 among males from angina pectoris and coronary thrombosis. Chart 1 illustrates this table.

TABLE VI.

AVERAGE ANNUAL DEATH RATES PER 100,000 FROM ANGINA PECTORIS (CORONARY DISEASE) OCCUPIED AND RETIRED MALES, ACCORDING TO AGE AND SOCIAL STATUS, ENGLAND AND WALES, 1931-1933.

| | 45-54 | 55-64 | 65-74 | 75 and over |
|--------------|-------|-------|-------|-------------|
| Class 1..... | 59.8 | 199.4 | 439.0 | 547.6 |
| Class 2..... | 41.5 | 119.2 | 274.4 | 400.9 |
| Class 3..... | 26.3 | 76.2 | 165.6 | 205.5 |
| Class 4..... | 19.2 | 51.8 | 125.1 | 172.9 |
| Class 5..... | 20.6 | 47.7 | 103.4 | 166.9 |

If these rates are standardized on the basis of age, the following proportional figures are obtained:

| | |
|--------------|-------|
| Class 1..... | 100.0 |
| Class 2..... | 64.2 |
| Class 3..... | 38.7 |
| Class 4..... | 28.5 |
| Class 5..... | 26.2 |

DEATH RATES FROM CORONARY DISEASE (MALES) BY AGE AND SOCIAL CONDITION ENGLAND AND WALES 1930-1932

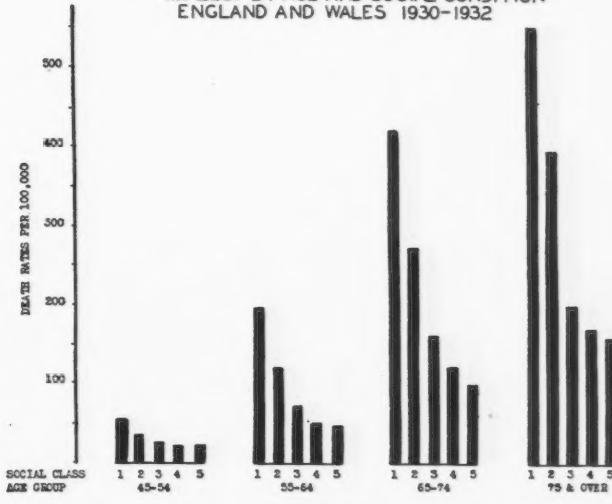


Chart 1

It is seldom that the lower economic groups can show a low mortality experience, for most diseases the mortality in Classes 4 and 5 is much greater than the higher economic classes, but certainly in the case of coronary disease, unless we are to assume a wide variation in diagnostic technique as applied to the various classes, there is a profound difference in experience.

Data in connection with 15 specific occupational groups are given in Table VII. These 15 groups have been selected more or less at random from nearly 90 occupational classifications. The populations at risk are somewhat small in some of the groups but it is to be remembered that the experience extends over three years. The data in the table are the averages of these three years.

The figures in Tables VI and VII are impressive. To account for them in any other way than as statements of fact one would have

TABLE VII.

DEATH RATES BY AGE FROM ANGINA PECTORIS AND CORONARY DISEASE AND STANDARDIZED DEATH RATES FOR AGES OVER 45 IN CERTAIN OCCUPATIONS, ENGLAND AND WALES, 1930-1932.

| Occupational group | Population | Average annual death rate per 100,000 | | | | | Standardized rate 45 and over |
|--|------------|---------------------------------------|-------|-------|-------------|-------------|-------------------------------|
| | | 45-54 | 55-64 | 65-74 | 75 and over | 45 and over | |
| Agricultural and gardeners' labourers | 221,737 | 7.8 | 25.9 | 71.1 | 116.6 | 38.3 | 31.6 |
| Coal hewers and getters | 157,281 | 15.2 | 52.4 | 90.7 | 109.3 | 42.6 | 46.2 |
| General labourers | 499,848 | 23.4 | 50.3 | 108.6 | 156.7 | 53.0 | 55.4 |
| Builders', plasterers', bricklayers' and masons' labourers | 59,029 | 29.8 | 50.6 | 122.1 | 298.3 | 57.6 | 69.1 |
| Road transport motor drivers | 63,473 | 24.7 | 83.8 | 175.1 | 192.6 | 50.4 | 81.1 |
| Railway engine drivers | 31,415 | 21.4 | 88.8 | 234.3 | 130.6 | 85.9 | 88.2 |
| Fitters, mechanics and tool makers | 106,671 | 39.3 | 84.9 | 175.2 | 215.1 | 80.6 | 89.1 |
| Commercial travellers | 50,813 | 49.0 | 105.4 | 285.1 | 405.7 | 116.1 | 131.0 |
| Typists and other clerks (not civil service) | 147,751 | 45.0 | 115.9 | 290.0 | 364.0 | 120.5 | 131.2 |
| Bank and insurance officials | 23,635 | 42.9 | 159.4 | 413.6 | 486.2 | 160.8 | 174.0 |
| Clergymen except Roman Catholic priests | 24,742 | 46.9 | 180.2 | 475.6 | 393.6 | 234.4 | 188.3 |
| Managers in certain occupations | 134,388 | 49.9 | 155.9 | 441.2 | 822.8 | 183.8 | 200.9 |
| Wholesale proprietors | 43,295 | 59.5 | 192.7 | 515.7 | 617.1 | 214.8 | 218.3 |
| Judges, barristers and solicitors | 13,656 | 97.6 | 155.6 | 565.5 | 787.4 | 307.6 | 241.5 |
| Physicians and surgeons | 16,009 | 80.0 | 313.0 | 628.9 | 825.9 | 343.6 | 299.6 |

to assume a wide variation in diagnostic practise among doctors attending the various occupational and social groups. Regarding these figures the Registrar-General has this to say: "The figures seem to show that general cardiovascular failure is more likely to occur without anginal symptoms amongst those engaged in manual occupations, but whether this is due to the coronary arteries being maintained in a more healthy condition or to the greater demands made on the heart by physical exertion or to nervous, dietary or other peculiarities associated with professional or sedentary occupations is a matter for surmise. The fact that women are relatively less liable to angina pectoris than to the other categories of degenerative heart disease makes it appear doubtful whether a sedentary form of occupation is an important factor in producing the high angina rates in classes 1 and 2." The Registrar-General in making this statement appears to assume that women follow a sedentary habit. This assumption is, I think debatable. The majority of women in the age groups chiefly affected by coronary disease are housewives. It is doubtful whether the occupation of housewife should be classed as sedentary.

Many authors attribute the high incidence of coronary disease among the members of the higher economic groups to nervous strain. This hypothesis might be developed on a rational basis for the influence of the nervous system and the emotions on the heart is well recognized. However at present no direct re-

lationship between emotional strain and coronary disease has been traced.

Denny² asks whether it is not really sedentary habits which constitute the underlying cause. He traces in parallel the rise of coronary disease and the increased use of motor cars, which has resulted in the case of most car owners in a decrease in habitual exercise and its replacement by spasmodic and sometimes excessive exercise. Here again we find ourselves in the realm of speculation. A similar parallelism could be drawn between the increased use of automobiles and the increase in cancer. Few will deny the proposition that the human body was designed as a machine and not simply as a nerve centre, but one cannot conclude that its use as a nerve centre and its disuse as a machine is a cause of disease of the coronary arteries. It seems reasonable, lacking proof to the contrary, to believe that coronary disease is actually increasing and that it is a disease peculiarly associated with high pressure intellectual activity and probably low pressure or spasmodically regulated physical activity. The association, if actually true, does also suggest that the individual in the dangerous occupation might well consider a reversion to a more physiological way of living.

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RÉSUMÉ

Depuis que les causes de mort dues à l'atteinte des artères coronaires figurent sur la liste internationale des causes de mort, les statistiques ont changé au point de faire quintupler en 10 ans les morts par angine de poitrine et par maladies coronariennes. En réalité, on a déplacé vers les coronaires ce qu'on attribuait au myocarde. Quoiqu'il en soit, il est vrai que le sexe masculin paye un tribut double aux maladies coronariennes, par rapport au sexe féminin; il apparaît aux statistiques que les simples manœuvres sont moins exposés aux dégâts coronariens que les individus préposés à un travail sédentaire et les intellectuels. Les statistiques anglaises, américaines et canadiennes s'accordent sur ces constatations. Pour discutables qu'elles soient elles engagent cependant à réviser nos conceptions de l'hygiène individuelle, notamment de l'hygiène du système nerveux.

JEAN SAUCIER

RADIOLOGICAL FINDINGS IN THE TERMINAL ILEUM AND THE PROXIMAL COLON: A TWENTY-FIVE YEAR POST-OPERATIVE RETROSPECT*

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FROM the operations that have been performed at the Bigelow Clinic, upon the terminal ileum and proximal colon, during the course of the past twenty-five years, one thousand consecutive cases have been selected for study. Comparison will be made between the pathological conditions, discovered by the surgeons at operation, and the findings indicated by the radiologist prior to operation, since it was on these latter findings that the need for operation was based.

Among the operative findings were the classical disease conditions, such as, 12 cases of carcinoma of the cæcum and 6 cases of tuberculosis of the ileo-cæcal region. Other conditions found not related to, but proximal to, this ileal-colon region, were 20 cases of right tubal and ovarian disease, while 19 operations were done for the fixation of a retroverted uterus. This leaves 943 cases in which the main cause of trouble was found to be the existence of pathological bands or membranes extending from the parietal peritoneum across the terminal ileum, the appendix or its mesentery, the cæcum, the ascending colon, and the hepatic flexure.

The presence and importance of these bands has been emphasized by me in several previous communications.

In 1921¹ before the Manitoba Medical Asso-

ciation, I drew the attention of the members to the existence of such bands, to the possibility of their diagnosis by x-ray only, and to the fact that their removal surgically gave relief from pain. In 1924² before this association I again discussed these bands, their distinction from adhesions, and the necessity for their recognition by the radiologist.

Now, again, I wish to re-emphasize this condition, and to bring to its discussion the results of the experience of a quarter of a century.

The proper approach to the examination and treatment of any disease condition is the clinical. The first thing to determine is, from what symptom or symptoms the patient seeks relief.

In the series which we are analyzing the main symptom from which the patients sought relief was pain, pain which had continued from three months to six years. Chronic pain in the abdomen was the main complaint in 700 cases. The site of the pain in 440 cases was the right lower abdomen. In 31 cases it was felt in the left lower abdomen, and in 40 cases across the whole lower abdomen. In 75 cases the pain was felt in the right upper abdomen, and in 47 cases it was epigastric in location. In 67 cases the pain was felt over the whole abdomen, and not localized to any particular section.

Other symptoms of which these patients complained were, vomiting in 82 cases, constipation in 164 cases, and pain across the back in 77 cases.

* Read at the Seventy-second Annual Meeting of the Canadian Medical Association, Winnipeg, June 26, 1941.

Chronic pain in the right lower abdomen is by far the predominant symptom, in this series, for which the cause must be determined and relief secured. In our discussion of this pain problem we must find the answer to three questions. (1) What was the cause of the pain? (2) Did the operation of cutting these bands give relief from pain? (3) How accurately and fully did the radiologist indicate to the surgeon the presence of these bands regarded as the cause of this pain?

What was the cause of the pain? The answer to this question involves a discussion of the condition of so-called "chronic appendicitis". While chronic appendicitis does occur, as evidenced in this series, yet it does not play an important part in the production of right iliac pain. In the first place evidence of chronic disease, or of the results of chronic disease of the appendix, was observed by the surgeon in only 147 cases in this series, while 480 appendices were described as covered with bands, and an additional 73 as fixed by these bands, while in 161 cases the appendix was described as free and normal. Further as confirming the lack of importance of the appendix as the cause of right iliac pain it has been observed by the surgeons, when they formerly did the operation of cutting bands, under a local anæsthetic, that the handling of the appendix did not cause pain, but when a pull was made on the parietal peritoneum through the bands which covered the appendix, the pain was felt as severe and similar to that from which the patient sought relief. Further the simple removal of the appendix, without removal of the bands covering the appendix and adjacent organs, did not give relief from this right iliac pain, as attested in 196 cases re-operated on subsequent to a first operation usually performed in another hospital for the removal of the appendix only.

These bands which were found so often covering the appendix, are only a part of that general pathological banding which was found covering all these intestinal organs in the right lower quadrant of the abdomen. The terminal ileum, appendix, cæcum, ascending colon, and hepatic flexure were all to a greater or lesser degree, involved in this process. These bands take their origin from the parietal peritoneum and run transversely or obliquely across these organs. As they undergo organization they constrict or kink, and eventually cause fixation

of these organs. The pain they occasion is produced by their pull upon the parietal peritoneum. This parietal peritoneum has a somatic innervation, and hence is capable of pain.

The importance of these bands is further attested by the great frequency of their occurrence. They occur in greatest numbers on the cæcum, which was banded in 911 of the 943 cases. Next came the ascending colon, banded in 594 cases, the appendix banded in 480, the terminal ileum banded in 291 cases, and the hepatic flexure, banded in 273 cases.

The foregoing considerations furnish conclusive evidence that these pathological bands were the main feature in the causation of right iliac pain in these 943 cases.

The second question to be answered is, Did the operation of cutting of these bands give the patient relief from their right lower abdominal pain?

In answering this question I quote from two call-in reports obtained by Dr. Bigelow from patients on whom he had done the operation for the removal of bands. In 1930³ he reports 520 responses to his questionnaire, with 93 per cent stating that they had received complete relief from their right-sided pain. In 1937⁴ there were 147 responses to another questionnaire, and 92 per cent reported complete relief from the right sided pain.

Describing the operation Dr. Bigelow says— "A high McBurney incision is made. A very thorough and complete removal is made of all bands and membranes. The appendix, if present, is removed. Minute bleeding points are tied off. Hot compresses of one in ten thousand bichloride of mercury are applied to the freshly denuded peritoneal surfaces. The operation area is carefully dried and a very thin coating of sterile vaseline is applied with the gloved fingers. Post operative treatment is very important." I have quoted thus extendedly from Dr. Bigelow's paper, because, on the meticulous care with which this operation is performed, and after treatment regulated, depends success or failure in accomplishing the purpose of the operation.

The third question which must be answered is, How correctly and completely did the radiologist indicate the conditions which the surgeons found at operation?

In a general way it may be stated that where the radiologist indicated the presence of bands they were almost invariably found by the

surgeons. Occasionally, however, cases which came to operation for other conditions, showed the presence of bands which the radiologist, in his routine examination, had not recognized; and almost invariably the extent of the bands was much greater than the radiologist had indicated. These criticisms have become much fewer in recent years, since the radiologist has learned to employ additional methods in his examination. Among these newer methods, has been the rotation of the patient on to the left side, while under the fluoroscope, and the applying of tension on the band areas in the direction in which it would be applied in ordinary body positions. As this is done one often hears the exclamation from the patient, "That brings the pain from which I have been suffering."

As to the methods of examination we get most of our information from the barium enema under the fluoroscope. The barium meal, however, is also important and should be regularly employed.

Among the features which are best observed after the barium meal is the visualization of the appendix. It is seen more commonly at the twenty-four hour observation after the barium meal, and frequently remains visualized until the barium enema is given, which regularly is administered forty-eight hours after the barium meal.

Other information obtained best after the barium meal is that in regard to the emptying time of the ileum. The matter of ileal stasis is best settled at the eight hour observation after the barium meal. At this time three-fourths of the meal should have passed the ileo-cæcal valve. If but half the meal or less has passed, there is some degree of stasis. Ileal stasis is however, not a matter of prime importance since it occurred in but seventy-one of the cases of this series.

Cæcal stasis, as differentiated from ileal stasis, is also best determined after the barium meal. Following the twenty-four hour observation of the barium meal, it is our custom to give an effectual laxative, such as one and a half or two ounces of castor oil. If, after the action of the oil, all the colon is evacuated, except the butt of the cæcum, then advanced cæcal stasis is present. This advanced type of cæcal stasis was present in 18 of the cases reviewed in this series. Cæcal stasis is important from the standpoint of bands at the butt of the cæcum,

since it is one of the end results of these bands, the portion of cæcum proximal to these bands, becoming dilated, and forming a stagnant cesspool from which toxic absorption occurs.

While the barium meal has its importance in certain phases of the diagnosis of bands, yet it is from the barium enema given under direct fluoroscopic observation, that we obtain most of our information in the actual technique of demonstrating the bands themselves. Here the static filling, observed at various periods after the administration of the barium meal, is replaced by the active process of filling while under direct observation. Further, the fluoroscope is of much more value than the radiograph, since frequently, the band, which was in evidence during the process of filling, has been quite obscured when the bowel has been completely filled, and the radiograph is ready to be made.

We are now ready to answer our third question, "How accurately and completely did the radiologist indicate the band which the surgeon found at operation?"

We classified the findings of the surgeons as bands of the appendix, terminal ileum, cæcum, ascending colon, and hepatic flexure. Similarly we classify the findings of the radiologist. But the radiologist has this advantage which the surgeon does not possess. He is manipulating an active, functioning organism, which can make a response to pain. On the contrary, the surgeon, if he is using a general anæsthetic, is dealing with a flaccid organism, which has been rendered quiescent by the general anæsthetic, and is incapable of giving the response to pain.

The factors which guide the radiologist in forming his decision as to the presence of bands are as follows: First, the barium stream, on making its progress through the large bowel, suddenly stops. The forefront flattens out as against a wall. A narrow stream of barium, promptly or after more or less delay, trickles through this solid front, either at its centre or periphery. The colon fills beyond the point of constriction leaving a narrow constricted area, which may remain visible, or may become obliterated as the barium fills the bowel beyond. The radiologist then manipulates, by the examining hand, preferably ungloved, and determines whether the visualized point of constriction is fixed by the band, which he has learned to recognize as the cause of the constriction, or whether that portion of the bowel

is fairly movable. He then carries his manipulation further, by making traction in the direction he knows these bands extend and determines whether tenderness is present. Finally he notes whether the section of bowel, in which this band is evident, is deformed or dilated, or kinked.

In a few words what the radiologist is looking for are banding, fixation, fixation with deformity, delay, and tenderness. Under these headings we classify the radiological findings in these, the 943 cases of this series.

1. *The cæcum* was reported as banded 390 times. The banding was accompanied by delay in filling 120 times. The cæcum was fixed 367 times, and deformity accompanied that fixation 215 times. The cæcum was tender 618 times. Thus we have a total of 1,710 evidences of cæcal bands in 943 cases. This is explained by the fact that many cases had more than one evidence of disease. This total of the radiologists' findings in connection with bands of the cæcum tallies well with the findings by the surgeons of 911 cases in which the cæcum was banded, fixed, and deformed.

2. *The ascending colon* was reported by the radiologist as banded 87 times, delayed in filling 35 times, fixed 42 times, deformed 33 times and tender 79 times. This makes a total of 267 evidences of ascending colon bands. This contrasts with a finding by the surgeon of 594 cases of bands in the ascending colon. This discrepancy may mean either or both of two things. It may mean a difference in defining the point at which the cæcum merges with the ascending colon. There is no very discernible line of demarkation between the two. This discrepancy between the figures of the radiologist and those of the surgeons may be due to the fact that in the ascending colon you are getting up into a more or less fixed region, in which many of the radiological evidences of banding are difficult to elicit.

3. *The hepatic flexure* was reported as banded 16 times, delayed in filling 21 times, fixed 5 times, deformed 4 times, and tender 16 times. This makes a total of only 62 evidences of bands of the hepatic flexure. This also contrasts with 273 banded hepatic flexures found by the surgeons. There are many reasons again for this discrepancy in figures. This region is much more difficult to diagnose by the radiologist. First there is the difficulty of distinguishing between normal ligamentous

support and abnormal bands. Then there is the normal delay at the flexures which must be distinguished from abnormal delay occasioned by the bands. It requires a nice balancing between the normal and the abnormal. A wide experience in observing barium enemas is helpful. This region is specially important, since our surgeons express the belief that bands of the hepatic flexure are among the commoner producers of pain, and many an operation will fail if their removal is neglected.

In justice to ourselves we should say that our radiological statistics in regard to finding bands in the ascending colon and hepatic flexure are in recent years much better than over the whole period of 25 years. This is due to our adoption of the improved methods of examination mentioned earlier in this paper, namely the rotation of the patient on to the left side and the use of traction, under the fluoroscope, along the line of direction of the bands.

4. The *terminal ileum* was reported as banded 49 times, delayed in filling 7 times, fixed 96 times, deformed 48 times, and tender 194 times. This makes a total of 394 evidences of bands of the terminal ileum. This agrees fairly well with the 291 cases of banded, fixed, deformed terminal ileum found by the surgeons.

5. The *appendix* was visualized by the x-ray and tender 93 times, seen to be banded 3 times, fixed 13 times, and deformed 4 times, a total of 113 times in which appendix disease was diagnosed as a distinct entity, apart from its neighbours, the terminal ileum, and the butt of the cæcum. This small proportion of appendix troubles diagnosed by the x-ray, as compared with the 480 banded appendices found by the surgeons, is due to the fact that only a small number of appendices are visualized under the x-ray.

Summarizing the radiological findings as a whole in regard to bands, in the 943 cases of this series, we find that tenderness was elicited 802 times, banding was described 444 times. This was accompanied by delay an additional 154 times, with fixation 419 times, and with deformity of the organ, such as kinking, dilation, or displacement, 276 times. This makes a total of 2,095 evidences of banding and its complications, shown by the radiologist. This is in comparison with the finding by the surgeon of 911 cases of banding of the cæcum, 594 cases of banding of the ascending colon, 273 cases of banding of the hepatic flexure, 291 cases of

banding of the terminal ileum, and 480 banded appendices, or a total of 2,549 points of banding in the 943 cases of the series.

These statistics are not meant to be of mathematical accuracy. The findings of the radiologist do not exactly parallel those of the surgeon. But these statistics do indicate that the radiologist can, by and large, indicate to the surgeon, with a satisfactory degree of fullness and accuracy, the things which he will find in the terminal ileum and proximal colon regions, especially in regard to the condition of banding which is being recognized more and more in the case of right sided abdominal pain.

I appeal to radiologists to pay special attention to this condition. Do not neglect *bands* because the evidence of their presence may seem insignificant, and their demonstration difficult. Search for the causes of this very common condition, right sided lower abdominal pain. Correlate your findings with the symptoms which they are capable of explaining. Weigh impartially the evidence of the presence of bands as the cause of the pain and the possibility of relief being obtained by their removal. Interest your surgeons in this somewhat neglected field. By so doing you will aid in the accomplishment of that object, for which all physicians should strive, the alleviation of human pain.

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RÉSUMÉ

Sur 1,000 opérations pratiquées sur l'iléon et les colons proximaux au cours des 25 dernières années, 943 fois la cause du syndrome abdominal fut l'existence de brides pathologiques, ou membranes allant du péritoine pariétal à l'iléon terminal, à l'appendice ou à son méso, au cæcum, au colon ascendant et à son coude hépatique. Ces brides peuvent être mises en évidence par la radiographie et leur résection fait cesser habituellement le syndrome douloureux. Dans l'appendicite chronique opérée sans que les brides soient réséquées la douleur abdominale a persisté et il a fallu réopérer pour pratiquer la bridectomie, après quoi les douleurs cessèrent. Mais il n'y a pas que l'appendice qui soit le siège de ces brides: par ordre de fréquence après le cæcum (911) viennent le colon ascendant (594), l'appendice (480), l'iléon terminal (291) et le coude hépatique du colon (273). Ces brides sont la cause habituelle de la douleur puisque celle-ci disparaît dans 93 pour cent des cas après l'opération. L'évidence radiologique de ces brides est obtenue par le repas baryté et par le lavement baryté suivi de l'examen fluoroscopique. L'évidence est encore précisée par la localisation exacte de la bride qui est déterminée par l'examen direct, par les douleurs ressenties par le malade lorsque celui-ci est invité à se coucher sur le côté gauche, et par la palpation manuelle. Sans avoir une exactitude mathématique, l'examen du radiologue guide singulièrement le chirurgien et force ce dernier à explorer davantage la cavité abdominale pour rechercher les brides toutes les fois qu'il opère pour syndrome abdominal douloureux.

JEAN SAUCIER

INDUCTION OF LABOUR: INDUCTIONS, METHODS AND DANGERS*

By W. S. HOLMES

Saskatoon

RECORDS show that rupture of the membranes to induce labour was used as early as 1690, but according to Denman, it was not generally advocated until 1756 when a conference of physicians was held in London to devise means for doing away with the frightful mortality then following Cæsarean section for contracted pelvis.

Though contracted pelvis was the condition which made induction of labour a popular procedure, the indications were extended to include all the obstetrical problems of the last trimester. Widespread employment of this procedure reached its height in the first decade of the twentieth century.

At this time, Caldwell tells us, 5.7 per cent of all cases at Sloane Hospital for Women had labour induced by the use of bags; Voorhees used them in one out of every four of his private cases. The excellent results reported led many to attempt it who were less skilled in the selection of patients and in the management of the complications which frequently arose. Such a course of events was bound to produce a reaction. So Cæsarean section came back.

Cæsarean section had in the meantime been showing a gradually decreasing mortality due mainly to two improvements. It was being employed before the onset of labour and the extra-peritoneal route had been developed. The reaction, however, was too great and today many women are subjected to this operation who could

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safely be delivered by the methods found so effective in the early part of the century.

Induction of premature labour means the artificial interruption of pregnancy after the child has become viable. Generally speaking this means between the thirtieth and thirty-eighth week of gestation, since the child has little chance of survival before the thirtieth week and for all practical purposes the patient is at term at the end of thirty-eight weeks.

Following are some of the commonest indications for the premature termination of a pregnancy:

A. Disproportion:

1. Moderate contraction of pelvis.
2. Postmaturity and history of oversized baby.

B. Disorders compromising the mother primarily:

1. Toxaemia of pregnancy.
2. Kidney insufficiency.
3. Cardiac insufficiency.
4. Essential hypertension.
5. Tuberculosis.
6. Diseases of blood and blood-forming organs.
7. Diseases of the glands of internal secretions (thyrotoxicosis, diabetes mellitus).

C. Conditions compromising the baby primarily:

1. Placenta prævia.
2. Premature separation of normally implanted placenta.
3. Hydramnion.
4. Habitual death of the fetus.
5. Malpositions including breech.

Contraction of the pelvis.—There is no place for induction of labour in definite contraction of the pelvis. The danger to the child is too great. The same problem will arise in subsequent labours and Cæsarean section is clearly indicated. In moderately contracted pelvis between 70 and 75 per cent of the patients will deliver normally if allowed to go into spontaneous labour. With the low cervical Cæsarean section it is possible to deliver these women after a test of labour with safety. The classical Cæsarean section is not so safe, once labour has started. Modern x-ray technique makes it possible now to determine whether or not the fetal head can traverse the pelvis.

Attempts with castor oil, quinine and pituitrin may be made when the cervix is soft and the head fits into the superior strait. Stretching the cervix and rupturing the membranes will increase the efficacy of the method. Bags and bougies should not be used for fear of compromising the mother if Cæsarean section becomes necessary.

Postmaturity and history of oversized baby.—This is the most frequent indication for the induction of labour at present. The history must

be evaluated and a careful examination made. The dangers of postmaturity are an unusually hard head which will not mould and which will cause dystocia or death of the fetus before or during labour. Oxytoxics have proved most effective and are least likely to compromise the mother and child. Rupture of the membranes, if the head is well down into the superior strait, especially if the cervix is partially dilated, hastens the delivery. Bags and bougies are effective in hastening the labour but are apt to fail if the uterus does not respond to oxytoxics.

**DISORDERS COMPROMISING THE MOTHER
PRIMARILY**

Toxaemia of pregnancy.—The mortality in toxæmia of pregnancy has been definitely reduced by the tendency during the past thirty-five years to treat the mother without compromising her by the forcible delivery of the child. If in spite of active treatment the toxæmia constantly increases, induction of labour is indicated, and even in the fulminating toxæmias better results are obtained by these means than by major abdominal surgery.

Experience seems to prove that simple rupture of membranes is all that is required in the majority of instances to start pains. This is especially true when the head is deeply engaged. Increased irritability and tonicity of the uterine musculature enhances the value of this procedure and labour often progresses faster than in the normal patient. It has been observed also that when convulsions are present, their number and violence are reduced by rupture of the membranes.

In view of the fact that many of these patients are obese and œdematos, puncture of the sac is much the easiest surgical procedure and may be performed in an environment where insertion of bougies or bags would be out of the question.

Medical methods of induction have quite a high percentage of failures and quinine and pituitrin are not innocuous drugs even in the normal patient. Dieckmann has shown that pituitrin increases the blood pressure in the toxic patient while it produces no change in the blood pressure of the normal patient.

Kidney insufficiency.—Chronic nephritis complicating pregnancy has so many symptoms similar to those of the acute toxæmias that it might almost be included in that group for the purposes of this discussion. Usually, symptoms of

the exacerbation of chronic nephritis become evident before the third trimester of pregnancy but when the nephritis is more advanced these symptoms may appear very early.

If the disease is of a very mild grade, or if the diagnosis is in question, sometimes the patient may be carried along under careful observation and medical measures.

If this is of such a degree that medical management fails, induction of labour is indicated in the interest of both mother and child. The mother's health should not be endangered by an attempt to carry the pregnancy further for the sake of the child which is itself being compromised by the toxæmia.

Like the patients suffering from the true toxæmia of pregnancy, these patients are bad surgical risks and should therefore be subjected to a minimum of surgical trauma and a minimum of drug therapy including anæsthetics.

Cardiac insufficiency.—When this develops during the last trimester it is best managed by treating the patient and disregarding the pregnancy. If the heart repeatedly becomes decompensated, interference is necessary. It should be done when the heart is compensated or as nearly so as possible. Delivery during decompensation by any means gives a high maternal and fetal mortality. Operative procedures increase these risks. The most dangerous time is immediately after delivery. Cæsarean section does not reduce the risk. The bag may be of great value in securing dilatation of the cervix and then the membranes may be ruptured and when the head reaches the perineum it should be delivered at once.

Essential hypertension.—Essential hypertension is a progressive, and so far as we know, an incurable disease. When a woman with this disease shows a constantly rising blood pressure she runs several risks including cerebral haemorrhage, and heart failure and labour should be induced under these circumstances.

Tuberculosis.—In deciding the course of action in dealing with the pregnant woman suffering from tuberculosis, the advice of the tuberculosis expert is invaluable. The greatest problem arises during the first half of gestation. There is less controversy regarding management in the later months.

In general terms it seems inadvisable to interfere with the pregnancy regardless of the stage or the state of the pulmonary process after the child is viable except in so far as induction may

be used to avoid the protracted course of labour common to this group of patients.

And in addition to this measure it is well to avoid a prolonged second stage as in the case of the patient with heart disease.

DISEASES OF THE BLOOD AND BLOOD FORMING ORGANS

Anæmias.—The mild secondary anæmia so common in pregnancy occasionally becomes severe. Medical treatment and transfusion usually yield satisfactory results and only rarely is interference necessary. Patients with primary anæmia seldom become pregnant, and the cases thus far reported are too few to permit of general conclusions. When the disease develops during pregnancy the outlook is grave. In any of the anæmias of severe grade a transfusion should be given prior to any method of delivery including spontaneous labour. The increased liability of infection should be borne in mind when considering any operative measures.

Leukæmias.—The prognosis varies with the time of onset of the disease. Women suffering from chronic leukæmias rarely become pregnant. When pregnancy does occur it usually aggravates the disease, although it rarely causes danger, and improvement as a rule follows delivery (Winter). The induction of labour should be done only in cases of dyspæna and severe intra-abdominal pressure. In the acute forms of leukæmia developing during pregnancy the prognosis is invariably bad, and an immediate emptying of the uterus is indicated when the condition is diagnosed. Fortunately this complication is extremely rare.

DISEASES OF THE GLANDS OF INTERNAL SECRETION

Thyrototoxicosis.—Disturbances in function of the thyroid gland are common during pregnancy. They may arise during pregnancy or may be present before pregnancy, becoming aggravated by the gestation.

Women with colloid goitre and no hypothyroidism go through pregnancy uneventfully and have normal children. If there is any marked degree of hypothyroidism they are prone to abort. Medical management in these cases is most satisfactory.

Hyperthyroidism often results in sterility. It is a serious complication arising during pregnancy. Some of the milder cases respond to iodine and bed rest and carry successfully to term, the disease disappearing completely in the

puerperium. Those who do not respond to this therapy should undergo partial thyroidectomy after iodine therapy has prepared the patient for surgery. The optimum time for operation should not be allowed to pass.

Interruption of pregnancy is only necessary when serious organic damage has been done, notably to the heart.

Diabetes mellitus.—There is probably no complication of pregnancy requiring greater vigilance than this. Insulin must be adjusted to the need of the individual subject. Since this need will change with the altered carbohydrate metabolism of the mother and the fetus, daily tests of the urine should be made by the instructed patient and weekly determinations of both urinary and blood sugars made by the attending physician. Joslin and his associates state that miscarriage, stillbirth associated with toxæmia and neonatal death are not predicated by disturbances of diabetes *per se*, but rather by an abnormal balance between prolactin and oestrin.

In view of the fact that these babies tend to be overweight we ought to be able to reduce the risk appreciably by reducing the caloric intake and inducing labour before the calculated date of delivery. Cæsarean section may be advisable when the strain of labour seems prohibitive by reason of the precarious condition of the patient.

In dealing with these medical problems the obstetrician and internist should share the responsibility. Since the internist has appeared in our obstetrical wards we have done better obstetrics.

CONDITIONS COMPROMISING THE BABY PRIMARILY

Placenta prævia.—A notable advance in the treatment of this grave complication of pregnancy was made when Snow and Powell in 1934 reported the advantages of soft tissue roentgenography in localizing the placenta. The general trend toward Cæsarean section in the treatment of placenta prævia makes it clear that the vaginal measures heretofore used in dealing with this complication have left much to be desired. The use of bags and Braxton Hicks version require skill and great care otherwise the cervix may suffer severely. Artificial rupture of the membranes has its greatest usefulness in the mild cases of marginal placenta prævia.

The Willett forceps has certain advantages over the bag in cases of marginal and partial placental prævia. It is easy to apply and will pass where a finger will.

Central placenta prævia is best treated by Cæsarean section.

Eastman after a study of various surveys of the subject comes to the following conclusions:

1. The liberal use of blood transfusion is prerequisite to the successful outcome of any form of treatment.

2. Rectal examinations are inconclusive and dangerous. Sterile vaginal examination should be made only after the operating room is set up for the immediate institution of any form of treatment that may be indicated including Cæsarean section.

3. Provided the patient is not infected, all cases of central placenta prævia and all cases of partial placenta prævia in primigravidæ are best treated by Cæsarean section.

4. Most cases of marginal placenta prævia in multiparæ are best handled by rupture of the membranes, or, possibly by rupture of the membranes and the Willett forceps.

Premature separation of the normally implanted placenta.—The most complete review of this subject was made by Irving in 1938. His survey leads him to the conclusion that conservative measures are accompanied by a considerably lower mortality than is Cæsarean section. These measures are designed to control bleeding, improve contractions of the uterus and thereby hasten delivery. Those who follow the conservative method have found that the application of a tight vaginal pack, secured to a pressure binder by a perineal band, would check the haemorrhage, and that labour would supervene if the membranes were ruptured and small doses of pituitrin were given repeatedly. According to Eastman this recommendation reflects a trend in the treatment of this condition which is general.

Hydramnion.—This condition presents a not infrequent indication for induction of labour. Rupture of the membranes relieves overdistension and is usually all that is required. Should the presenting part not fit well into the lower uterine segment or should the cord prolapse following rupture of the membranes, a bag may be used.

Habitual death of the fetus.—With the history of habitual death of the fetus, induction of labour well in advance will frequently result in the birth of a normal baby. A cessation of the growth of the uterus, frequently accompanied by a decrease of the mother's weight, warns of

the approaching death of the fetus. The use of a bag is to be preferred to drugs.

Malpositions including breech.—If breech and other malpositions cannot be corrected by manipulation and if the baby seems large as term approaches, induction prematurely will render extraction of a breech or version and extraction safer for the baby. Most obstetricians prefer a bag in such cases.

METHODS

Medical.—Castor oil, quinine and pituitrin in varying doses and in varying combinations are used with considerable success if the patient is at term or close to term, the cervix soft and dilatable, and the head engaged. Quinine and pituitrin must be given with caution, bearing in mind that the size of the dose and the interval between doses can only be determined by watching the patient's response. Falls believes that five grains of quinine gives better results than fifteen grains and states that he has seen strong pains caused by the smaller dose result in the precipitate delivery of badly asphyxiated babies.

Pituitrin is a dangerous drug and must never be ordered indiscriminately and at predetermined intervals. A competent observer must watch its action on the uterus constantly and be ready to use an anaesthetic if the contractions become tumultuous. Apart from the danger of rupture of the uterus, the increased tonicity of the uterine muscle without relaxation disturbs the circulation of the uterus and hence the placental circulation. The efficacy of medical induction is greatly enhanced by rupture of the membranes or by gentle stretching of the cervix and stripping the membranes, either before starting the induction or after the uterine contractions have become established.

Rupture of the membranes.—The safest and oldest method of inducing labour is the rupture of the membranes. Though labour is ultimately induced in all cases, in many the onset is delayed for many hours or even days endangering both mother and baby from infection. In a small proportion of cases the cord may prolapse immediately. The effectiveness of the method is increased by stretching the cervix, giving oxytoxics, or, if labour is delayed, by using the bag. This method is most valuable where the cervix is soft, the uterus irritable, as in pre-eclamptic toxæmia, and the presenting part well down in the brim.

Guttmacher and Douglas compared results obtained by bag, bougie and rupture of the membranes on quite a large group of patients. They concluded that artificial rupture of the membranes proved more successful, that the fetal mortality was lower and that the maternal mortality and morbidity were lower than when bags or bougies were used.

Bougies.—The advantage of the bougie is the ease with which it can be inserted without any dilatation, which makes it of particular value in a long rigid cervix. The objections are: the danger of infection which may follow its use, and which seems to be higher than with other methods, the possibility of rupture of the membranes, disturbance of the placental site, the length of labour following its use, and the frequency of failures, usually given as 15 to 20 per cent.

Examination of uteri after bougie insertion has shown a well-marked tract of infection corresponding to the site of the bougie and a definite spread of that infection with every hour it was left in. When the bougie is removed it should be with the understanding that the method has failed and with the intention of resorting to some other method. It may be used in conjunction with medical induction and some use it to secure some dilatation and softening of the cervix and then insert a bag. Packing the cervix and vagina enhances the value of the bougie and assures its remaining *in situ*. Effectiveness increases with both the size and number of bougies used.

Bags.—The action of the bag is three-fold: First, it mechanically dilates the cervix from above downward like a fluid wedge, in which respect it closely resembles the bag of waters: second, by its presence and by the dilatation of the uterus which its increased volume causes the uterus is stimulated to action and third it may be used as a tampon as in *placenta prævia*.

It has a definite field of usefulness in the following types of cases: (1) To replace the bag of waters. (2) In cases of malposition in which the presenting part does not fit well into the superior strait and where there is no bony obstruction. (3) To control bleeding in *placenta prævia* and to induce labour in accidental haemorrhage. (4) To shorten an established labour either spontaneous or induced. (5) The bag is the method of choice in nephritis and in cases of habitual death of the fetus where quinine and pituitrin are not advocated.

Its period of greatest value is in the last few weeks of gestation. Voorhees, after fourteen years' experience, advised the use of the bag only when the cervix is soft and dilatable.

Cæsarean section is regarded by some as the easiest solution of every obstetrical problem. Kosmak of New York City, however, has pointed out that if the statistics for the whole of the United States are taken, they show that of the total deaths occurring in pregnancy in that country, nearly 20 per cent followed Cæsarean section, and that infection constituted the principal cause of death in almost 50 per cent of these.

There is still a definite place for induction of labour. Each case must be studied separately and constant attention given to the progress of the labour. Skill and judgment are often tested to the utmost in handling the emergencies which sometimes arise.

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ORTHOSTATIC HYPOTENSION

(REPORT OF A CASE)

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ORTHOSTATIC hypotension, a condition first described by Bradbury and Egglestone¹ in 1925, is really a syndrome complex in which orthostatic hypotension represents the main symptom. The underlying disturbance causing postural or orthostatic hypotension as well as many other symptoms is related to disease of the central nervous system. However, the direct relationship of this condition to the central nervous system has been determined in but few cases. The reason for this, apparently, depends on the fact that the reported cases were observed at different periods of the development of the condition. Whether multiple causes should be held responsible for the etiology of the syndrome complex or a separation of this latter type from all other varieties of orthostatic hypotension, has not yet been decided. A detailed discussion of this problem as well as a brief review of the literature is given later.

The following case report of orthostatic hypotension illustrates its relationship to the central nervous system.

CASE REPORT

A business man, aged 49, consulted the author on June 12, 1941, because of attacks of unconsciousness. His health was good until one and a half years before when he took a "severe cold" which kept him in bed for over three months. Subsequently he began to complain of dry tongue, constipation, loss of libido and sexual power, inability to perspire, general weakness, and indefinite changes in his nervous system. Attacks of syncope occurred when he stood erect or while walking. Careful questioning however, revealed that these attacks of syncope were related to change in posture. In the recumbent and sitting posture he felt well but got dizzy or com-

tose on rising quickly and less often while walking, and if unable to sit or lie down he collapsed. The attacks of unconsciousness were gradually getting worse, especially on hot days, and associated with them was a general feeling of weakness even in the recumbent position and indefinite symptoms of fear and restlessness. He found the inability to perspire and even more the dryness of his tongue and constipation very distressing and further complained of difficulty in urination. The loss of weight was slight.

Physical examination.—The patient is well developed, 5 feet 8 inches tall, and weighs 142 pounds. He is pale and alert looking, appears rather younger than his age but has a careworn expression. His hair is thick, coarse, and nearly white. His movements are quick, his tongue and skin dry and there is no abnormal pigmentation or oedema. There is a small post-traumatic ulcer in the left leg which is very tender and shows little tendency to heal. There is no exophthalmos, no enlargement of the thyroid or enlarged cervical lymph nodes.

Examination of the nervous system reveals a positive Romberg's sign and absence of knee and ankle jerks. The behaviour of the pupils especially deserves to be stressed. They are enlarged (6 mm.), irregular, unequal, and do not respond to light or on accommodation; they remain unaltered in darkness and dilate under mydriatics, the left more than the right. Under homatropin the irregularity of the pupils was not noticed; eserine produced contraction in half an hour.

Examination of the chest: breath sounds normal, no râles are heard. The heart, which is centrally placed, has the form of a "drop heart"; the cardiac impulse though not visible can be detected by palpation in the fifth interspace 8 cm. from the midsternal line; heart sounds normal, no accentuation of the second sound. Cardiac rhythm regular and slow: 60 to 66 per minute. The blood pressure on account of its extraordinary changes is dealt with later. The abdomen reveals no abnormality.

Laboratory data.—X-ray examination of the gastrointestinal tract negative; bladder examination essentially negative. Basal metabolic rate: minus 4.5. Hinton, Kahn, and Wassermann tests negative. The serum protein 5.8 g., and the albumen-globulin ratio normal. Gastric analysis showed no free hydrochloric acid. Total non-protein nitrogen 36.7 mg. per cent. Sedimentation rate (Westergren): normal. Red cell count: 4,408,000, white cells 10,400. Haemoglobin, 83 per cent. The red

cells showed some achromia, microcytosis and a little poikilocytosis and a few punctate basophilia, but no nucleated red cells were detected. Although a slight absolute leucocytosis was present the differential Schilling count revealed no shift to the left. The spinal fluid Wassermann and colloidal gold curve negative and total protein 23 mg. Urinalysis negative, stool negative for blood.

Electrocardiogram essentially negative and showed no substantial variation in the upright position.

Some of these laboratory findings were made at a clinic in October, 1940, at a time when the orthostatic condition was not so evident. The dry tongue, incapacity to perspire, etc., were there explained: "on the basis of a parasympathetic imbalance, chronic nervous exhaustion, nicotinic excess and Adie's syndrome."

The behaviour of the blood pressure and pharmacological investigations.—The blood pressure in the recumbent posture varies from 130 to 126 systolic and 80 to 85 diastolic. The pulse rate is constantly slow, varying from 60 to 72. Table I shows the behaviour of the blood pressure with regard to the time interval after change in posture. Thus, when the patient lies down after standing for a while, his blood pressure rises as high as 150/98. It is noted further that the "zone of weakness" lies between 72/56 and 56/40 and that below this is the "zone of syncope". The pulse rate remains unchanged during all changes of posture and even after exertion.

TABLE I.

BEHAVIOUR OF BLOOD PRESSURE AND PULSE TO CHANGES IN POSTURE

| Posture | Time | Blood pressure | Pulse rate | Symptoms |
|-------------|----------------|----------------|------------|---|
| Recumbent | | 130/86 | 72 | |
| Standing .. | Immediately | 98/66 | 72 | Feels well. |
| " | After 1 min. | 72/56 | 76 | Mild vertigo. Weakness, dimness of vision. |
| " | After 2 mins. | 56/40 | 76 | Syncope. |
| Recumbent | Immediately | 98/70 | 78 | No symptoms. |
| " | After 1 min. | 120/86 | 78 | |
| " | After 2 mins. | 150/98 | 78 | Feels well. |
| " | After 20 mins. | 130/86 | 72 | |

With the head in a horizontal position and with the cuff at the level of the brain at an angle less than 45° the blood pressure readings are not substantially changed.

Table II shows the effect of the Flack test on changing posture. It is noteworthy that the patient was able to maintain the mercury column at 40 mm. mercury in the recumbent and sitting posture for over 30 seconds with little or no change in the pulse rate, but definite

changes in the blood pressure occurred, though normally there is little.

Atropin injections (1/100 gr. intravenously plus 1/100 gr. subcutaneously) had no effect on the pulse rate which remained constant at 72 per minute. The blood pressure readings after the injection varied from 136 to 140 systolic and 86 to 90 diastolic when taken at various times. The "standing up" blood pressure readings recorded were: immediately after, 78/46; 1/2 minute later, 58/46 with marked dizziness and syncope. On assuming the recumbent posture: immediately after, 87/56; 10 minutes later, 145/100; 15 minutes after, 136/86. Some accentuation of the dryness of the tongue was noted 28 minutes after the injection.

Pilocarpin (1/10 gr. subcutaneously) produced sweating all over the body within seven minutes. The blood pressure readings were low, varying between 98/78 and 88/54. On standing up 15 minutes later, it fell rapidly to 65/52 with symptoms of extreme weakness.

It is notable that on two occasions in which higher blood pressure readings were obtained, some perspiration was also present.

Epinephrin (0.25 c.c. of a 1:1,000 solution injected subcutaneously) produced an unusual and paradoxical effect on the pulse rate and blood pressure, namely a slight increase in the former and a drop instead of a rise in the latter and the patient got dizzy as soon as he arose (see Table III).

The tilted "head-up" bed, as recommended by MacLean and Allen² in the treatment of certain cases of orthostatic hypotension, proved beneficial. After 36 hours in this position, while his pulse rate remained at 72 the blood pressure readings gave the following results: recumbent: 128/88, standing up: 76/60 (82/66) and the patient was able to walk around without vertigo or other complaints.

Further interesting results were obtained in conjunction with this "head-up" treatment by injecting 0.25

TABLE III.

EFFECT OF 0.25 cc. EPINEPHRIN ON PULSE AND BLOOD PRESSURE

| Time p.m. | Position | Blood pressure | Pulse rate | Symptoms |
|-----------|-------------|----------------|------------|------------------------|
| 4.45 | Recumbent. | 140/90 | 70 | No symptoms. |
| 4.50 | * | | | |
| 4.55 | Recumbent. | 140/84 | 84 | Slight nervousness. |
| 5.00 | " | 125/72 | 90 | Some palpitation. |
| 5.10 | " | 112/62 | 84 | |
| 5.13 | " | 100/65 | 84 | No symptoms. |
| 5.15 | Standing... | 50/43 | 84 | Dizziness and syncope. |
| 5.20 | Recumbent. | 106/62 | 84 | Feels well. |
| 5.30 | " | 115/70 | 84 | No symptoms. |

* 0.25 c.c. injected subcutaneously.

TABLE II.
EFFECT ON FLACK TEST OF CHANGES IN POSTURE

| Posture | Before | | During | | | Time* | 3 minutes after | | Symptoms |
|---------------|----------------|------------|----------------|------------|-----------------|---------|-----------------|------------|---|
| | Blood pressure | Pulse rate | Blood pressure | Pulse rate | | | Blood pressure | Pulse rate | |
| Recumbent .. | 128/83 | 66 | 90/70 | 60 | Over 30 seconds | 165/105 | 78 | | No dizziness, after test some perspiration. |
| Sitting | 120/82 | 66 | 88/72 | 60 | Over 30 seconds | .. | .. | | At the end of test mild vertigo. |
| Standing | 80/66 | 66 | ?† | ? | 25 seconds | .. | .. | | Syncope, falls on bed. |

* Time = how long Hg column of 40 mm. Hg can be maintained; † cannot be taken.

TABLE IV.

EFFECT OF 0.25 EPHEDRIN IN CONJUNCTION WITH
"HEAD-UP" TREATMENT ON BLOOD PRESSURE AND
PULSE RATE

| Time a.m. | Position | Blood pressure | Pulse rate | Symptoms |
|--------------|-------------|-------------------|---------------|--------------|
| 11.30 | Standing... | 62/35 | 72 | Weakness. |
| 11.32 | Recumbent | 100/72 | 72 | Feels fine. |
| 11.35 | " | 128/88 | 72 | No symptoms. |
| 11.37 | * | | | |
| 11.40 | Recumbent. | 130/92 | 84 | |
| 11.45 | " | 156/96 | 84 | |
| 11.48 | " | 156/100 | 84 | |
| 11.49 | Standing... | 88/62 | 84 | Not dizzy. |
| 11.51 | " | 76/68 | 84 | " " |
| 11.53 | " | 72/60 | 84 | " " |
| 11.54 | Recumbent. | 92/72 | 84 | |
| 11.55 | " | 142/96 | 84 | |
| 11.57 | " | 168/108 | 84 | |
| 12.00 | " | 170/108 | 84 | |
| p.m. | | | | |
| 12.10 | " | 170/106 | 84 | |

* Injection of 0.25 c.c. of ephedrin subcutaneously.

c.c. of ephedrine (see Table IV). Here the pulse rate did not increase much, but the blood pressure rose, with relatively small doses, and remained so for a longer period.

However, benzedrine proved to be the preparation of choice in treatment. While still in the head-up position, 10 mg. of benzedrine were given at hourly intervals for three hours, and two hours later, about five hours after the first dose, the patient complained of an intense headache and felt nauseated. The blood pressure was then over 210/145 with a pulse rate of 90. None of the usual remedies gave relief, but the headache disappeared immediately on standing and his blood pressure fell to 100/80, while the pulse rate remained between 90 and 84 per minute. Up to the present time (August, 1941) the patient has been getting 30 mg. of benzedrine daily (10 mg. at 7 a.m., 5 mg. at 9 a.m., and at 11 a.m., and 10 mg. at 2 p.m.) and he has no vertigo. His blood pressure readings are between 128/94 sitting and 86/70 standing. His pulse rate has increased and varies between 84 and 90. On certain specially hot days he still suffers from brief spells of dizziness.

The same dosage of benzedrine, however, proved ineffective when the head-up bed was omitted. Blood pressure readings gave only 90/78 (80/68) sitting, and 70/56 standing, and the pulse rate was 86. Although the outside temperature was rather lower than on the previous days, he had more frequent attacks of weakness.

Paredrine is now being tried along with benzedrine and the results will be published subsequently.

DISCUSSION

This patient presented the characteristic signs of orthostatic hypotension with weakness and sometimes syncope, while remaining in the erect position for a few minutes without moving around. Besides anhidrosis, constipation, failure of the pulse rate to vary with change in posture and after exertion, and loss of sexual power, the most striking symptoms were the neurological ones. Following the injection of atropin the heart rate did not change, while ephedrine and epinephrine caused a slight increase. The failure of the blood pressure to increase after epinephrine in the recumbent posture and the imme-

iate manifestation of syncope in the upright position after its injection deserves special attention. It should be emphasized that in the head-up bed small doses of ephedrine produced rises in both the systolic and diastolic pressure but only a relative increase in the heart rate, and also no vertigo on assuming the upright 10 minutes after the injection of 0.25 c.c. The head-up treatment together with comparatively small doses of benzedrine (25 to 35 mg. daily), proved to be the remedy of choice, the patient even on hot days being benefited. His blood pressure, too, both systolic and diastolic, has increased on standing upright and so has the pulse rate.

The neurological findings deserve to be emphasized because orthostatic hypotension is, here, not only associated with but, in my opinion, also caused by definite disease of the central nervous system. The fact that the above mentioned symptoms were manifested after a "cold" or "influenza", and the pseudo-tabetic symptoms in the absence of a positive blood and cerebrospinal Wassermann are very suggestive of a post-encephalitic type of disorder, giving rise to the present imbalance of his autonomic nervous system. Lesions of the latter type after encephalitis are known to occur, and v. Economo has described a "pseudo-tabetic" form of encephalitis. In my case the pupils are not only found unequal but also fixed to light and on accommodation. This phenomenon, too, may be seen as a result of epidemic encephalitis.³ It is true, the pupils in the present case have more a tonic character than that of the Argyll-Robertson one, but this does not negative the organic nature of the lesion, for Adie's syndrome is obscure in its etiology⁴ and the emotional instability in cases of it has even led to the assumption that the syndrome is functional. It is known, too, that lesions of the hypothalamus may be found in cases of encephalitis. As the function of the automatic nervous system seems to be controlled by the centre in the hypothalamus, which co-ordinates the various afferent impulses in order to prevent imbalance,⁵ some of the disorders of the sympathetic nervous system present in this case can thus be explained, namely, anhidrosis, lack of reflex-vasoconstriction, failure of the heart rate to increase after exertion and atropin.

The symptoms of the central nervous system are usually not prominent enough to draw attention to them and for this reason the ortho-

static hypotension has assumed the main place in the syndrome complex. As pointed out earlier, this syndrome complex seems to manifest itself in different stages, so much so that the relationship between orthostatic hypotension and the central nervous system has been more suspected than determined, since definite neurological signs were found only in the following cases in the literature: one of Bradbury and Egglestone,¹ Ganshorn and Horton,⁶ Croll *et al.*,⁷ Allen and Magee,⁸ Chew *et al.*¹⁰ (two cases, one with tabes), Jeffers *et al.*¹² (one tabes), Strisower⁹ (tabes), Ellis and Haynes¹¹ (four, two with tabes, one with syringomyelia), and in the present case. Woltman⁶ has seen one case with involvement of the pyramidal tracts. In this connection, it is important to stress the fact that our patient in October, 1940, did not show definite signs of orthostatic hypotension though the neurological features were present then. Here, the disease of the central nervous system developed before orthostatic hypotension appeared. Woltman⁶ in discussing the relationship between postural hypotension and the neurological findings states: "It is conceivable that hypothalamic, or more caudally placed lesions may upset circulatory homeostasis through interruption of the sympathetic pathways. We know such can be brought about in cats, with a knife, but we must wonder why we do not see it in cases of tumour of the brain and encephalitis. Perhaps it has escaped us for our examination in this direction is admittedly faulty".

On examination of the above and some other cases in the literature^{6, 10, 11} it appears that the disturbance underlying orthostatic hypotension lies in disease of the central nervous system affecting mainly the sympathetic nervous system, abnormality of which explains the failure of the vasomotor reflex to operate normally, the an- or hypo-hidrosis, the failure of the heart rate to increase in the orthostatic posture, after exercise, and atropin. The relationship between it and orthostatic hypotension has been determined in but few cases including the present one, and suspected from the extensive involvement of the central nervous system which other patients exhibited.^{6, 10} Furthermore, in cases which did not show neurological signs involvement of the central nervous system is probable from the presence of anhidrosis, behaviour of the pulse rate, etc.

However, all the cases reported do not belong to this syndrome complex. Probably only a few, associated with tachycardia in the upright position^{10, 13, 14} ought to be included, while many others^{15, 16} should be excluded from it. I think that even cases in which the disturbance of the vasomotor regulation due to involvement of the centres of the spinal cord such as nerve injury secondary to arterial occlusion,¹² and cases with tabes, should be separated, as well as those cases of orthostatic hypotension associated with tachycardia due to functional defect in the circulatory system (Jeffers *et al.*¹²).

With the above in view, the following classification of orthostatic hypotension is suggested:

1. The syndrome complex of Bradbury and Egglestone, in which orthostatic hypotension is due to marked impairment of the reflex vasomotor function from organic disease of the central nervous system. Cases of tabes, or syringomyelia may simulate this syndrome complex but do not show all the classical symptoms and form a sub-group.
2. Orthostatic hypotension related to disturbance of the endocrine glands (cases with Addison's disease¹⁷ and others^{18, 19}).
3. Orthostatic hypotension following surgical sympathectomy,^{2, 12} trauma²⁰ or localized lesions affecting primarily the peripheral nerves.
4. Orthostatic hypotension associated with tachycardia due to functional disorders of different types.^{2, 12, 16}
5. Orthostatic hypotension with mechanical defect in the circulatory system.¹²

SUMMARY

A case of orthostatic hypotension with definite neurological signs involving the central nervous system from an influenzal type of encephalitis is reported. The effects of atropin, pilocarpin, epinephrine, ephedrine, and benzedrine are described. The vertigo was favourably influenced by small amounts of benzedrine combined with the "head-up" treatment of MacLean and Allen.

A brief discussion of orthostatic hypotension and a suggested classification of the different varieties from an etiological viewpoint is given.

I wish to express my sincere thanks to Professor Ralph P. Smith, Department of Pathology, Dalhousie University, for his aid in the preparation of this paper.

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SEQUELÆ OF INTRASPINAL ANÆSTHESIA*

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IN approaching the problem of the sequelæ related to intraspinal anaesthesia it is important to study the failures of the past, but it is still more important to anæsthetists to perfect themselves in the expert procedures of intraspinal anaesthesia today and to learn the means of avoiding the possible complications. The warning of Babcock is very much to the point: "The dangers of spinal anaesthesia remain largely with the user rather than the drug or technique employed". No system of anaesthesia even under the most favourable circumstances is yet entirely free from complications, but no branch of surgery has made such decided progress during recent years as anaesthesia. This applies to all types of procedures, including intraspinal.

Thus the increasing realization by the modern surgeon of the necessity for team-work with the anæsthetist, and of the relation of the ultimate surgical results to the expertness with which the anaesthesia is administered, has been a most potent factor in the reduction of serious complications and sequelæ. It should be emphasized that the administration of the anaesthetic includes the pre-operative examination and preparation of the patient by the anæsthetist and intimate consultation with the surgeon in respect to the post-operative care and treatment in the ward. Further, it should be repeated, it is just as urgent that the expert anæsthetist follow in the operating room the minute-to-minute progress of the patient under spinal anaesthesia, as under any other type of anaesthesia. The practice during the formative years of the art of spinal

anaesthesia of placing some inexperienced person in charge of the anaesthetized patient, did much to multiply the disasters and the sequelæ which the literature of the past ten years has compiled for our reading. Further, during this formative period the perfecting of the pharmacology of the various cocaine solutions presented and of the technique employed has been a process of evolution with a progressive and steady decrease in the complications and sequelæ experienced.

I do not propose to discuss in detail the sequelæ which writers and experimenters have expounded in the literature of the last ten years. We shall consider only those which appear to be of practical significance to anæsthetists of today, who conform to the procedures that are recognized as reasonably safe and expert. This list of sequelæ may include any of the following: headache, certain cord symptoms, retention of urine, backache and sensory and motor changes in the legs, ocular palsies and pulmonary complications.

In a general way it cannot be denied that during the years of development, damage to the nervous system has occurred, some of a permanent and serious nature. Nevertheless it must be pointed out that serious lesions have become rare in recent days since expert procedures have been followed more consistently. However, Hyslop's conclusion must still prevail that "Sequelæ cannot be regarded as absolutely preventable, and that an accurate idea as to the frequency of minor or major unavoidable sequelæ does not exist."

No doubt there are occasional patients who have a hypersensitivity through a constitutional predisposition to cocaine preparations, and there are patients who have diseases of the

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central nervous system, the cardiovascular system or the blood, and therefore are more disposed to manifest some permanent damage to the central nervous tissue, and still more likely to experience a degree of aggravating temporary symptoms. In several thousand spinal anaesthetics used by the Calgary Associate Clinic we have never seen any serious neurological complications. Pemberton of the Mayo Clinic stated that he had never noticed a serious neurological complication where usual precautions had been observed. Foss and Bush in reporting 5,000 consecutive spinals concluded: "We have never seen in the hospital a single example of serious cord or meningeal injury. . . . We have not discovered prominent or even mild complications in our patients which would lead us to consider spinal a procedure possessing dangers outnumbering those commonly ascribed to other popular forms of anaesthesia. . . . In its daily use over a period of ten years in thousands of cases we do not recall a single incident in which the patient complained of symptoms of any consequence. . . ."

No one can question such prolonged changes in the cord as reported by Davis, Haven, Givens and Emmett, Lindemulder and others, and Lindemulder was probably justified in summarizing his conclusion in the following sentences: "One may advance the theory that all spinal anaesthetics produce an acute myelitis. This usually lasts a few hours and may leave the patient with complaint of pain and paralysis for a period; but there are times when there is a permanent involvement."

At this point one may outline the results of Dr. John Lundy's experiments in respect to the importance of the concentration of the anaesthetic solutions used in spinals. The writer had the good fortune to be a visitor at the Mayo Experimental Farm as these conclusions were being tabulated. Dr. Lundy used large police dogs and proved that the central nervous system of these dogs was capable of withstanding huge doses of drugs. Every dog that became permanently paralyzed died within 4 to 10 days, and none of the dogs that were not paralyzed died. He demonstrated that 5 c.c. of a 20 per cent (or more) solution caused permanent paralysis, and that 5 c.c. of a 17.5 per cent (or less) solution did not cause permanent paralysis. He also showed that 2.55 c.c. of 50 per cent solution did not cause permanent paralysis but 10 c.c. of 12.5 per cent solution did. In his report he pointed

out that "the results obtained clinically at Mayo Clinic and the results in these experiments were strikingly similar in one respect, *viz.*: the dose of procaine will produce different degrees and duration of anaesthesia depending on its dilution. For instance, 3 c.c. of 5 per cent solution gives more profound and longer anaesthesia than 5 c.c. of 3 per cent solution." As a result Dr. Lundy set his procedure of never exceeding 7 or 8 per cent, the usual dilution being of 3, 4, or 5 per cent. The results of Dr. Lundy's experiments strongly suggest the probable source of much of the cord damage reported in the literature.

In logical sequence therefore I may now urge that in the administration of procaine, pontocaine and such drugs, the avoidance of central nervous and other complications demands the careful selection of the location and nature of the spinal puncture, the dosage of the drug injected, the concentration and volume of its solution, the rate of the solution's diffusion into the subarachnoid space, and the postural changes of the patient, particularly during the early period following the injection.

Much that has been mentioned above applies equally to the reported sequelæ of backache, cauda equina radiculitis, and leg sensory or motor changes. In these regards, as also in respect to headache, the frequent presence of neurosis must never be overlooked. It must be borne in mind also that one of the definite symptoms of a prolonged lack of oxygen with even moderate cerebral anoxia is persistent headache. Further, any of the complaints mentioned may be the accompaniments of abdominal operations in which any type of anaesthesia has been employed. In spite of this more optimistic side, an occasional case of permanent damage that cannot be thus happily explained is recorded authentically. It is probable that there have been rare cases where a nerve root in the cauda equina has been impaled, but to do so is an immeasurably difficult feat. When puncture is made above the second lumbar it is much easier to damage a root and cause a temporary neuritis. Pain may be elicited when a root is touched but no permanent damage is done. Tovell and Stein report "In a series of over 10,000 cases in which spinal anaesthesia was induced at the Mayo Clinic, no permanent motor paralysis has been encountered".

In regard to bladder complications, our clinic has been using spinal anaesthesia in urinary tract operations and examinations almost daily for

over three years without serious complications due to anaesthetic. Drs. Roscoe Graham and Essen Brown also reported: "The authors have had no retention of urine with catheterization that was ever anything more than a nuisance".

We shall now discuss the occurrence of headaches. There is much literature on the question but our general conclusion apart from the headaches due to anoxia, is that most of them arise from irritation of the meninges of the cord or from leakage of the spinal fluid through the puncture wound of the membrane. The opinion of Dr. J. White-Morquecho of Mexico City is interesting to say the least. He contends that the specific causative factor may be established by determining whether there be the hypertension of meningeal irritation or the hypotension of leakage of the spinal fluid. He does not measure the pressure directly by puncture but practices Dr. Aceves' theory. The latter established that spinal fluid pressure in cubic centimetres of water equals twice the diastolic blood pressure measured in centimetres of mercury. Thus where the blood pressure is 70 mm. or 7 cm. of mercury, the spinal fluid pressure is 14 cm. of water, *i.e.*, normal. Therefore when headache is present and the blood pressure is more than normal, 10 per cent saline is given intravenously, *p.r.n.* On the other hand if the blood pressure is lower, distilled water is injected intravenously. However, many more anaesthetists are content to insist upon intravenous salines and glucose after every spinal and to use a No. 22 needle only, for all punctures. Again it is a recognized procedure that all patients remain absolutely flat or in partial Trendelenberg position for twelve hours at least. As a matter of fact a majority of headaches following operation occur in those patients whose surgical operations are not sufficiently disabling to keep them from stealing the sitting posture. Lastly, let it be recalled that headaches, both real and emotional, are by no means rare following inhalation and even local anaesthetics.

All observers appear to agree that the extra-ocular muscle paralyses are rare and temporary.

There still remains the consideration of pulmonary complications, which of course are still the bugbear of surgery, whether the anaesthetic used be spinal or otherwise, and, let it be stated, without any very significant differences in the frequency of such complications in respect to the various types of anaesthetics when such are administered expertly. The whole question, so far

as it relates to anaesthesia, entails a discussion of restricted breathing and fatigue of the respiratory centre from anoxæmia. Insofar as this question concerns spinal anaesthesia, we shall summarize steps that are taken to avoid respiratory complications. Such summary includes the careful selection of the cases for spinal anaesthesia so that proper gauge is taken of patients as respects the presence of low pulmonary alveolar surface due to disease, or poor oxygen-carrying power of the blood, or cardiovascular insufficiency. The patient is also prepared pre-operatively and particularly with pre-medication that will keep the metabolic rate low. After the spinal has been given, every possible step is taken to avoid surgical anoxia, by keeping the cardiovascular functions at a normal level by administering continuous 100 per cent oxygen inhalations during and after the operation when indicated, and, by using intramuscularly or intravenously vaso-constrictor drugs if required, and intravenous solutions when circulation volume needs increasing. Personally, I am convinced that a balanced anaesthesia which includes a lower dosage and concentration of intraspinal drug, and a stage 1 or stage 2 cyclopropane inhalation, or shallow sodium pentothal intravenously, has an important place in the prevention of surgical anoxia and particularly in upper abdominal surgery. Further, when there does appear any suggestion of pulmonary collapse following anaesthesia, intratracheal bronchoscopic aspiration should be undertaken at once before the obstructing plug has caused permanent damage behind it.

It is appropriate here that we return to the question of damage to the central nervous system during spinal anaesthesia. Tovell and other highly experienced anaesthetists insist that very many of these untoward effects in reported cases have been due to depression of the respiratory centre and a stagnation in the blood circulation. Such effects from anoxia may be temporary or permanent according to the degree of anoxia and the length of time it is allowed to continue.

Finally, I wish to refer to some of the recent experimental work of Dr. Pitkin. I shall outline his important conclusions only, leaving the details for your own study. He claims to have proved as altogether erroneous, the long-accepted theory that the ganglia of the sympathetic chain, the post-ganglionic fibres and white rami as such, influence or control blood pressure during spinal anaesthesia. Pitkin maintains that blood pressure

is under the regulation and control of the chromaffin bodies and glands, the most important of which are the carotid. These he contends, "are essential to the human body as a safety valve is to an engine". These glands secrete a chemical substance or chemical substances which work with or/and against suprarenin. Suprarenin secretion is supplied by the cortical portions of the suprarenal glands, which in turn are dependent upon the control of the sympathetic ganglia. The suprarenin of course is the vaso-constrictor, but has the additional property of prolonging anaesthesia. Pitkin explains that the "spinal anaesthesia shock" to which we ascribe so much, is "not due to the anaesthetic agent or to its effect upon the autonomic nervous system, but to a depletion of the systemic suprarenin brought about by anaesthesia of the suprarenal glands". Hence, when signs of beginning depletion of suprarenin start, we have been in the habit heretofore of giving systemic supplies of neosynephrin, ephedrin, etc. However, these drugs are oxidized rapidly and their effect at best is evanescent. Pitkin claims to have prepared a non-oxidizing suprarenin solution which can be given in conjunction with the intraspinal agent, which ensures for an indefinite period a continuous supply of suprarenin to the system, together with a great prolongation of the spinal anaesthesia. He claims also that the solution eliminates most of the post-operative difficulties which we meet. His claims for the

new solution may sound too good to be one hundred per cent true, but if the reported results of his experimental work be correct they will revolutionize our conceptions of the past in respect to the functions of the autonomic nervous system in spinal anaesthesia.

In conclusion, let me say that I have endeavoured to present a rapid but fairly comprehensive summary of the problem of spinal anaesthesia sequelæ as they present themselves today. If the conclusions reached may be accepted as reasonably accurate we may view with hope Dr. Pitkin's radical assertion: "There is no operation upon the human body that cannot be performed with greater safety and facility with spinal or conduction anaesthesia than with inhalation anaesthesia."

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Case Reports

CONGENITAL ARTERIOVENOUS FISTULÆ OF THE PINNA*

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This variety of congenital arteriovenous fistula has in the past been more commonly described as a cirsoid aneurysm, but it has not been until relatively recently that the underlying abnormality has been correctly interpreted. This consists of usually multiple direct arteriovenous communications grouped in a localized area, resulting from a congenital imperfection in the development of the vascular system. These fistulae result in a direct shunt of arterial blood into the veins, and thereby a lowering of the

local arterial pressure. This decrease in pressure favours an increase in arterial blood flow to the area, giving a dilatation of the arteries and thinning of their walls. An increase in arterial tortuosity is also coincident. The veins show involvement by marked dilatation of even the small ones, thickening of their walls and the development of varicosities of all sizes. The situation of the fistulae determines the effects and appearance; from that of enlargement and overgrowth of a limb when the main vessels are involved, to a localized area of disfigurement in the subcutaneous cirsoid varieties.

Mrs. G.A., 26 years; admitted to the Royal Victoria Hospital February 20, 1941.

Present history.—A swollen bluish upper portion of the left pinna has existed ever since birth. During her menstrual periods, the involved area always enlarged and became more engorged than usual. Two years ago during her only pregnancy a definite tumour commenced

* From the Surgical Service of the Royal Victoria Hospital, Montreal.

which enlarged progressively, and, at about full term, reached its present grape-like size. Pulsation in the tumour was first noticed toward the end of the pregnancy, as was also a pulsating bruit. Two weeks prior to admission the patient bruised the tumour with her comb, and since then, small amounts of serum had oozed from the scabbed abrasion. On the day of admission the scab was accidentally knocked off and a severe haemorrhage resulted, the patient losing about one pint of blood. Strong pressure was necessary to control the bleeding.

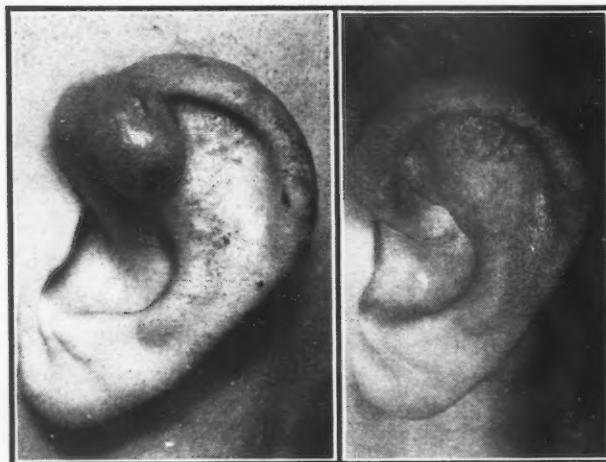


Fig. 1

Fig. 2

Fig. 1.—Pre-operative photograph showing grape-like tumour and the scab from the recent haemorrhage. The thickened bluish tissue and dilated venules are also evident. **Fig. 2.**—Three months post-operative. The tumour has been removed but involvement of the remainder of the pinna still persists.

Examination.—The upper half of the left pinna was thick and spongy as compared with the right. The colour was of a reddish cyanotic hue, and there were numerous dilated tortuous skin venules present both on the lateral and medial surfaces. Projecting laterally from the anterior end of the helix was a grape-size tumour attached by a relatively thick stalk. This tumour had a small blackish scab on its fundus. It pulsated, had a doughy consistency and was easily compressible. The pulsations of the superficial temporal artery on the left side were about twice as forceful as the right. On compression of the superficial temporal artery the tumour lost its tenseness and shrank to about half its former size, but still pulsated faintly. The auricular branch of the posterior auricular artery was not palpable nor was the parent stem.

Operation.—A small vertical incision was made in front of the ear over the superficial temporal artery. It was found enlarged to more than twice its normal size and was ligated at the level of the tragus. There was a marked network of smaller arteries and veins in the proximity of the main artery. The incision was closed.

The pulsations of the tumour were now extremely faint, and its size was much reduced. An elliptical incision was made around the base of the tumour and the skin flaps dissected back. Multiple ligations were necessary, for the numerous vessels in this area as bleeding was severe. The skin flaps came together easily but a pressure bandage was necessary to check the continuing ooze of blood. Silk technique was used.

Pathological report.—(Dr. Theo. Waugh). Sections show an overlying epiderm, beneath which in the corium is a large dilated vascular channel containing a small thrombus in the lumen. Beneath this and the epiderm were a large number of small blood channels.

Pathological diagnosis.—Hæmangioma with phlebangiectatic vein.

REPAIR OF A PERFORATED DUODENAL ULCER WITH A FREE OMENTAL GRAFT

BY G. J. A. KIRKPATRICK

Chatham, Kent, Eng.

J.E.F., an electric welder, aged 22, was admitted to hospital on March 3, 1941, at 2.30 p.m. complaining of generalized abdominal pain which had begun suddenly at 11.30 a.m. of the same day while he was tying his shoe-laces.

He stated that intermittently since the age of 14 he had pain half an hour after taking food.

On physical examination his abdomen was found to be moderately rigid. There was marked tenderness in the right hypochondrium and some tenderness in the right iliac fossa. On percussion liver dullness was much diminished. There were no other abnormal findings.

Perforated duodenal ulcer was diagnosed and he was operated upon at 3.30 p.m.

An upper right paramedian incision was made and on opening the peritoneum, a small amount of gas escaped. The perforation was found on the postero-superior wall of the duodenum $\frac{1}{4}$ of an inch from the pylorus. In this region there was a little bile-stained fluid.

Closure of the perforation was attempted first by inserting three longitudinal sutures. While tying these they cut through the friable tissue round the ulcer. They were removed.

A circular purse string suture was then inserted. This broke when tightened and was removed. Another purse string suture was inserted outside the periphery of the previous one, but on tightening this it cut through the duodenal wall.

Since there was no adjacent greater or lesser omentum which could be brought into position to cover the area, it was decided that a free omental graft must be used to close the ulcer and cover the raw area caused by the attempts at suture.

Accordingly a free omental graft approximately $1\frac{1}{4}$ inches square, was taken from the greater omentum and applied to the duodenum with the central portion of the graft over the perforation.

The edges of the graft were then sutured to the duodenum with interrupted sutures of catgut No. 1, approximately every $\frac{1}{8}$ of an inch. The graft was then firmly in place, but the central portion seemed rather thin. Accordingly two sutures of the same material were inserted, with entrance and exit points about $\frac{1}{4}$ of an inch within the edge of the graft. These sutures were lightly tied to produce some "rucking" in the centre of the graft.

The abdomen was closed in layers, without drainage.

Fluids by mouth are usually allowed 24 hours after operation in cases of perforated peptic ulcer. In this case they were withheld for 72 hours. Meanwhile fluids were administered by rectal drip.

The patient made an uninterrupted recovery and was discharged from hospital on April 4, 1941.

Two months later he reported he was feeling quite well and had no further indigestion.

ACUTE ERGOTISM

BY NORMAN H. OLESKER

Fairview, Alta.

I am reporting this case of acute ergotism on account of its rare incidence. I have been able to obtain scant information on this subject from textbooks.

Mrs. M., aged 31 years, was admitted to the Fairview Hospital on July 26, 1941. Her last period was on May

8, 1941, and she believed that she was about two months pregnant. She had had vaginal bleeding and lower abdominal pain of one week's duration. Large clots had been passed three days prior to admission, and on that day the patient claimed to have passed the fetus and placenta at home. She was admitted to the hospital complaining of faintness and excessive haemorrhage.

Physical examination revealed a weak, obese, pale woman. Her chest was negative; blood pressure, 112/74; pulse, 102. The only abdominal sign was slight tenderness above the pubes on deep palpation. There was no muscle splinting or rebound pain. No vaginal examination was done because of the bleeding.

A diagnosis of complete abortion was made and the patient was put to bed with an ice-bag to her fundus. She was to receive ergot 3 1, every four hours for six doses, and then three times daily.

On the afternoon of the second day I was called by the hospital matron. The patient had been vomiting all day. She was much paler than she had been on admission, had a cold clammy sweat, felt very dizzy, and was yawning. She looked deathly ill, was pulseless, and the blood pressure could not be obtained. The abdominal examination was negative and since admission the amount of blood lost *per vaginam* had been extremely scant. She believed that she was dying and begged me to take her to the operating room at once for curettage.

Here was a patient suffering from shock, and the common cause of shock in these cases is haemorrhage, *but no signs of haemorrhage, either external or internal, could be made out*. As the only medication she was receiving was ergot, a diagnosis of acute ergotism was made. She was treated for shock. Ergot was discontinued, and by the next day she was feeling quite well again.

I remember seeing only one other case of acute ergotism a few years ago. This was a private maternity case of Dr. M.W. who was delivered at the Woman's General Hospital in Montreal. That patient suddenly began to complain of severe pain in all her muscles, nausea, dizziness. She resembled the first case mentioned very much, except that she was also markedly cyanosed. She was treated in the same way with a good result.

It is surprising how little is said about acute

ergotism in those textbooks that even mention it. De Lee in his book gives the following signs and symptoms *en passant*—"pallor, dizziness, nausea, bradycardia, acrocyanosis, etc."

The following two paragraphs are taken from Osler.

"The prolonged use of meal made from grain contaminated by the ergot fungus (*Claviceps purpurea*) causes a series of symptoms known as ergotism, epidemics of which have prevailed in parts of Europe. In acute ergotism there is acute enteritis with nervous system manifestations. Two forms of chronic ergotism are described—the one, gangrenous, is believed to be due to sphacelinic acid, the other, convulsive or spasmodic, is due to cornutin. In the former gangrene affects the extremities—usually the toes and fingers, less commonly the ears and nose. Preceding the gangrene there are usually anaesthesia, tingling, pains, spasmodic movements of the muscles, and blood stasis in certain vascular territories.

"The nervous manifestations are very remarkable. After a prodromal stage of fourteen days, in which the patient complains of weakness, headache, and tingling sensations in different parts of the body, perhaps accompanied with slight fever, symptoms of spasm develop, producing cramps in the muscles and contractions. The arms are flexed and the legs and toes extended. These spasms may last from a few hours to many days and relapses are frequent. In severer cases convulsive seizures develop and the patient may die in them. Mental symptoms are common, manifested sometimes in a preliminary delirium, but more commonly as melancholia or dementia. Posterior spinal sclerosis occurs in some cases."

GERMAN VITAL STATISTICS.—An official bulletin gives the number of marriages in Germany in 1940 as 715,400 against 944,331 in 1939. The number of live births in 1940 was 1,644,752 and the birth-rate per 1,000 inhabitants 20.4. In the territory of the old Reich the birth-rate dropped to 20, the balance being made up by Austria, Sudetenland, Memel and Danzig. It is estimated that as a result of the war 150,000 fewer children were born in 1940. The number of deaths for 1940 was 36,450 more than in 1939. The death-rate increased by

0.4 per thousand to 15. This increase is attributed to the cold spell in 1940. The most important causes of death were cardiac diseases 19.6 per cent, cancer 16 per cent, cerebral apoplexy 10.2 per cent, pneumonia 9 per cent, tuberculosis 6.8 per cent. The increase in deaths from tuberculosis—2,000 more than in 1939—is also ascribed to the cold spell. Infantile deaths were roughly 7,500 more than in 1939. The death rate per 1,000 live births was 65. The net increase in population amounted to roughly 600,000.—*The Lancet*, November 15, 1941.

Editorials

WARTIME SURGERY

IT has been the custom of this *Journal* during this year to present to its readers lists of important articles and books relating to war topics. It is not pretended that these lists are complete, but, at least, they cover the current literature in journals which are readily accessible. It is hoped that these references will be helpful to all medical men, but particularly to those who are going overseas. The problems that confront the surgeon in the war areas are not very different from those which arose in the last Great War, except that in Britain there is a larger proportion of bombing injuries. As would be expected, the mortality here is relatively high, and in the case of those who survive complications of a medical character are often superadded, such as asphyxia, blast-injury to the lung, pulmonary thrombosis, pneumonia, gas poisoning, traumatic cyanosis, and shock, of course. All these factors should be considered by the medical man in addition to those more obviously of a surgical nature.

On the whole, it may be said with confidence that the majority of the surgical practices established as a result of the experiences of the last war have stood the test of time. The relative advantages of some few are still under debate, and it is here that the testimony of those surgeons who are in the thick of the trouble is worth considering.

In the present war certain phases of organization and practice seem to have evoked increased emphasis. Such are the more speedy evacuation of casualties to well equipped base and special hospitals, the handling of compound fractures, the treatment of shock, the more frequent use of injections of blood, serum, and plasma, and the attempts to obtain disinfection of wounds by the local application of some member of the sulfonamide group of drugs. Even the accomplished surgeon, and there are many such in Canada, will in the face of situations to which he is unaccustomed at times be somewhat at a loss to decide on the best course of action. His righteous

soul will be vexed when he sees his most cherished convictions flouted, as in the Winnett-Orr-Trueta method. The treatment of burns, also, will call out his best judgment. In such situations the most experienced surgeon and, still more, the neophyte in war surgery will be all the better for acquainting himself with the conclusions of others more experienced in special points.

Many books and articles have appeared which are helpful on such points. One of the most valuable of these is an address given recently before the American Surgical Association at White Sulphur Springs, W. Va., by Mr. Leonard Broster, Senior Surgeon of Charing Cross Hospital, London. It is full of meat, and as space will not permit us to give more than an inadequate abstract it should be read in its entirety*. Mr. Broster takes up such topics as medical organization, war wounds, bomb injuries, regional injuries, chemotherapy for war wounds, burns, blast injuries, crush injuries, and shock.

The closed plaster method of the Winnett-Orr-Trueta school, after debridement, and the application of one or other of the sulfonamides seems to be gaining in popularity, though there is still some difference of opinion. The "Yees" say "Seeing is believing": the "Nays" say "Smelling is disbelieving". Mr. Broster ranges himself with the "Yees", on the grounds that the method gives the maximum of comfort and eliminates many of the difficulties of transportation. Morale is high and there is practically none of that distressing condition that formerly was called "shell-shock." Also, it eliminates the dread of the painful daily dressing necessary under the open method.

Mr. Broster qualifies his approval however, with the proviso that the method requires constant supervision. On the appearance of quickened pulse, elevated temperature, pain, sleeplessness, loss of appetite, oedema, or coldness of the toes the plaster should be removed. Some surgeons, therefore, prefer

* *Brit. M. J.*, 1941, 2: 273; *Surgical problems of war, Annals of Surgery*, 1941, 113: 891.

to transport patients with a peeping window cut in the plaster over the wound, or, if the distances are short, to dispense with it altogether—as in such cases as fractures of the lower limb, in which the Thomas splint with traction has again proved its value. The sulfonamides may be used prophylactically by mouth, starting with 2 grams followed by 1 gram every four hours up to a total of 20 grams, but better, by insufflation into the wound in doses varying from 5 to 20 grams. In hospital the primary considerations are the arrest of haemorrhage, and the combating of shock, after which, and only then, excision may be undertaken. The aim is to obtain a clean saucer-like wound, which is best for drainage.

In bombing injuries the mortality, immediate and remote, is high. The injuries are multiple and traumatic shock is marked. The injuries should be treated on their merits, particularly those involving the vessels, nerves and viscera.

In blast injuries haemorrhages are found in the lungs, liver, spleen, adrenals, kidneys, intestines, bladder and, seldom, the brain.

Mr. Broster cites four principles of general application in regard to the head: (1) remove blood-clot, extradural or subdural; (2) remove infective material and dead brain tissue; (3) consider whether a retained foreign body should be removed on account of possible traumatic epilepsy; (4) there is a

definite impression that the sulfonamides tend not only to localize infection, but to delay the necessity for operation. Here is a pointer toward the adoption of conservative methods. The dural wound should not be enlarged unless the surgeon is prepared to remove necrotic brain tissue and clot to prevent tension. All foreign bodies, dirt, and fragments of bone should be removed. Retained missiles should be left alone unless the clinical signs spread and the cerebro-spinal protein content increases. Abdominal and thoracic wounds carry a high mortality. They are treated along the well-known lines.

The best treatment for burns is still under debate. Naturally a burn of the third or fourth degrees will require different handling from one of the first or second. The primary objects of treatment are to save life and limb, and to preserve function. The triple dye method is said to produce less scarring than tannic acid. The Bunyan bag, in which the wound is irrigated with hydrolytic sodium hypochlorite solution (5 per cent) has its advocates. The Edinburgh school advises the application of sulfanilamide and glycerine. Unless there has been concomitant haemorrhage blood transfusion is not indicated owing to the concentration of the blood which occurs. Blood plasma must be given to replace loss of protein and to prevent oedema.

But read the complete article. A.G.N.

CONTROL OF NARCOTICS IN CANADA

THE changes in the narcotic situation in this country, as shown by the latest report of the Narcotics Division of the Department of Pensions and National Health, are both encouraging and interesting. Much of the improvement is due to the steady efforts of the Narcotics Division aided by the indispensable Royal Canadian Mounted Police. But the effects of the war have also been beneficially evident; one of the very few which can be so described.

The most striking feature is the effect of the shortage of narcotics on the addiction problem. In many localities there is not only a shortage but a complete absence of narcotics from illicit sources. Smoking opium is still available at very high prices in certain

areas, but the illicit sources of morphine, heroin and cocaine have practically dried up.

However, the addiction problem is by no means entirely solved. The difficulty in obtaining supplies has made these people resort to all kinds of measures, from direct theft to the forgery of narcotic prescriptions. Aliases are freely used for obtaining prescriptions from several physicians at a time, as well as the simulation of various symptoms. All the familiar cunning of the addict is brought into play and it is sharpened by the desperation of deprivation. Members of the profession would do well to take the greatest precaution in protecting their supplies of these drugs as well as in prescribing them.

In Toronto for example, it was found that within a few months 18 addicts using 54 different names had obtained 300 prescriptions for 5 different kinds of narcotics from 76 physicians.

Another feature of the situation has been the increase in adulteration of illicit narcotic supplies. So marked has this been (sometimes reaching as high as 95 per cent) that there has been a definite effect in reducing addiction in some areas.

The traffickers of course have not failed to take advantage of the situation. There is no price ceiling with them! It has been established that in one city the illicit price of a quarter-grain tablet of heroin was steady for several months at \$3.50. This

means \$14.00 a grain or more than \$6,000.00 per ounce!

Not even the Middle Ages with all their weird and costly elixirs ever approached such heights. As the Report points out, "it is doubtful whether there is any other substance in existence, in relation to which there is such a tremendous variation between legal and illicit values."

The reduction in the ordinary consumption of these drugs is also remarkable. Codeine as such shows a drop of nearly 5,000 ounces, and the consumption of paregoric has been reduced from 5,050 gallons to 1,800. The imports of cocaine for 1940 have been reduced to 819 ounces, as compared with 2,192 in 1939.

H.E.M.

Editorial Comments

Rationing of Gasoline

In view of the likelihood that gasoline will be rationed, the General Secretary of the Association has been collecting data with regard to the use of automobiles by the profession. This information has been handed on to the Oil Controller, and he will take it into consideration in setting the quantity of gasoline to be allowed the profession. How much this will be we do not yet know, but there is no doubt that the information supplied by Dr. Routley will be of the greatest value in arriving at a fair apportionment.

Apart from their value in this respect however, these figures bring out some points of considerable interest. They are therefore reproduced below in condensed form. One rather surprising fact is the close approximation of the town and rural mileage. This however is explained by the fact that many rural cars do not operate for the winter months. In addition to this it is becoming possible for so-called "city" and "town" doctors to extend much of their practice into the neighbouring country. The mileage per gallon will also be noted as being practically the same in both town and country, which is explained as being due to the more difficult conditions of driving in the country.

RECAPITULATION OF CANADIAN MEDICAL PROFESSION IN RESPECT TO THE BUSINESS USE OF AUTOMOBILES

| | |
|---|--------|
| Total number of doctors registered | 10,492 |
| Inactive, or living outside Canada | 401 |
| City and town doctors | 6,965 |
| Rural doctors | 3,126 |
| Cars driven by city and town doctors | 6,557 |
| Cars driven by rural doctors | 3,020 |
| Total number of cars driven by Canadian doctors | 9,577 |

| | |
|---|-----------|
| Average mileage of city and town doctors' cars | 13,520 |
| Average mileage of rural doctors' cars | 14,735 |
| Average city and town gas gallonage per year | 866 |
| Average rural gas gallonage per year | 908 |
| Average mileage per gallon, city and town | 15.6 |
| Average mileage per gallon, rural | 16.1 |
| City and town cars use in a year (6,557 x 866) gallons gas | 5,678,362 |
| Rural cars use in a year (3,020 x 908) gallons gas | 2,742,160 |
| Total gas consumption per year, for all doctors' cars, in gallons | 8,420,522 |
| | H.E.M. |

How the War Affects Paper

Some of our readers may have noticed that the quality of paper used in recent numbers of the *Journal* was not up to our usual standard. It is slightly greyer and the printing is apt to show through a little.

We are informed by our printers that this is entirely due to war-time stringency. One stage in the manufacture of paper is that of bleaching the wood pulp to the desired whiteness. This is done by means of chlorine, which has been found to be the best agent, since it is not only strong, cheap and rapid in action, but is safe to use under proper control.

Formerly, when this process of bleaching the pulp was somewhat more crude, the familiar chloride of lime was sufficient. Nowadays, it is carried out in more than one stage, and large quantities of pure chlorine are required. Unfortunately chlorine is also widely used for war purposes, such as the bleaching and purifying of wood pulp and cotton for the manufacture of nitrocellulose, as well as other things. For this reason the pulp mills both in Canada and in the States have been ordered by the government to

use less chlorine, to the extent of a 50 per cent reduction or even more. We shall have to expect an even less satisfactory quality of paper as the war demands become more insistent, but methods of counteracting the present disadvantages are being sought. H.E.M.

**The Therapeutic Research Corporation
of Great Britain, Ltd.**

It is announced that a group of the leading manufacturers of medicinal products in Great Britain has formed an organization for the more effective prosecution of research in their industry. It is to be known as the Therapeutic Research Corporation of Great Britain, Ltd. The constituent founders of this Corporation are: Boots Pure Drug Co. Ltd., British Drug Houses Ltd., Glaxo Laboratories Ltd., May & Baker Ltd. and the Wellcome Foundation Ltd.

This is in no sense an amalgamation of the

Companies concerned. Each continues to retain complete freedom of action in its special fields, but they all contribute to what is actually a research pool. The names and high standing of the Companies named are familiar to the profession generally, although their length of establishment and actual work in research may not be equally familiar. So far, however, this research has been conducted on individualistic lines. This will not be the case with the Therapeutic Research Corporation. No new discoveries by the Corporation will be monopolized by any one Company.

The combination of such extensive research facilities as are possessed by these well established companies, together with their long experience in investigations of the most varied nature, should prove of very great value in medicine. It should also strengthen the gradually growing alliance between academic workers and those in industrial firms. H.E.M.

Retrospect

RADIUM TREATMENT OF CARCINOMA OF THE CERVIX*

BY ETHELYN TRAPP

Vancouver

In considering a suitable manner of approach to a subject on which so many volumes have been written, it occurred to me that it might be of interest to review the original ground work that has helped to make the radiological treatment of cancer of the cervix one of the most successful chapters in the field of cancer therapy. The historical view is always important; Churchill has reminded us in one of his broadcasts that people will not look forward who never looked backward. I refer to the work of the Cancer Commission of the Health Committee of the League of Nations. Incidentally, the accomplishments of this Health Committee are one of the bright spots in the history of the League, largely because the scientific representatives approached their problems with a truly international outlook, the lack of which has caused the work of its political representatives to come to such tragic failure.

The Cancer Commission of the Health Committee was set up in 1924. It was decided to begin with cancer of the cervix uteri, since in this site the usefulness of irradiation had already been established. With this object in view, a sub-committee of radiotherapists and gynaecologists was set up under the Chairmanship of Professor Regaud of Paris. At this time it was decided to confine the first investigation to the following three clinics, as having had their

treatment established sufficiently long to be of value for statistical purposes. The Radiological Institutes of Stockholm and Paris, and the Frauenklinik of the University of Munich.

Each of these Clinics prepared a report on its work since inception, with details of clinical procedure and methods of treatment. They agreed to adopt an international record form in order to facilitate the preparation of future reports. With the object of establishing a basis for comparable statistics, rules were adopted for: (1) The precise definition of the different varieties of uterovaginal cancer. (2) The classification of cancer of the cervix into stages according to the anatomical extent of the growth. (3) The definition of data necessary for statistical purposes. (4) The computation of the results obtained by treatment. (5) The recording of data relating to the technique of treatment. The details of these rules are set forth in the first report of the sub-committee published at Geneva in 1929.

When the Health Organization convened at Zurich in 1934 it was recommended that the analysis of the results of treatment by radiotherapy in cancer of the cervix estimated after a period of observation of 5, 6, 7 or more years should be issued annually. Directors of clinics and others interested were invited to communicate with the Chairman with a view to participation in these reports. The first was published at Geneva in July, 1937, and contained statements of methods and results from six different clinics, and comprised the five-year results on 757 patients treated in 1930. The second report was published the following year and referred to cases treated in 1931 and previous years. It included statements from nine centres

* Read at the Seventy-second Annual Meeting of the Canadian Medical Association, Winnipeg, June 26, 1941.

and furnished information on over 6,000 patients; 86.3 per cent having been radiologically treated. The third and last report so far published appeared in 1939 and referred to cases treated in 1932 and previous years. On this occasion sixteen centres participated, and the report included over 9,000 patients.

The war has prevented the publication of further reports, but the ground work has been laid and the value of this international effort established. The importance of the work is demonstrated by the fact that the three annual reports show a progressive increase in the number of clinics participating and in the number of patients reported. The average cure rate has also increased. In all these reports no attempt has been made to arbitrarily draw conclusions from past records, by assigning differences in cure-rates obtained to differences in method of treatment; though the Committee hopes to be able eventually to estimate the relative value of different treatment methods. For the guidance of clinics participating in these reports an atlas illustrating the four stages of cervix cancer was prepared by Dr. Heyman and his committee.

Other important reviews of work and statistics have been carried out from time to time. One of the first was that of Dr. Janet Lane-Claypon on the history of the treatment of cancer of the uterus and its status, published in 1926. In her monograph she collected and classified the end results of 80,000 cases treated at different clinics by surgery and by radiology. She found the survival rate to be practically the same for both methods of treatment, but since the surgical records were only of operable cases, the advantage of the radio-therapeutic approach was clearly demonstrated and Dr. Lane-Claypon's work was one of the factors influencing the choice of the uterus for this first clinical research work of the League.

Important records have been published since from both European and American clinics. In 1929 the late Elizabeth Hurdon of the Marie Curie Hospital, London, collected and reported on the most important of these. By that time irradiation of all cases of cervical cancer had become established practice in most places where there were important radium centres. The most recent review of such work is from the Cancer Committee of the San Francisco Gynaecological Society in July, 1940. They obtained by personal communication, data on methods of treatment and results from ten of the chief clinics of the United States and Europe, and have had this printed for private distribution.

These exhaustive analyses of series of cases have gone to show that all modern methods of treatment from recognized clinics show practically the same end results, the important consideration being, not the type of treatment employed, but the skill with which it is carried

out. There have, however, been several important landmarks in the development of treatment, each of which has been a definite step forward from the point of view of end results. The first of these was when the gynaecologists relinquished surgical for radiological treatment, this I might say was not done overnight. Certain German clinics were the first in the field and in the University Hospitals of both Heidelberg and Munich no cases were operated on after 1913. Gradually Sweden accepted the same attitude and since 1920 practically all cervical cancers have been treated by radium. The same attitude was later adopted toward cancer of the uterine body.

British and American clinics were not so unanimous in their acceptance of irradiation therapy, which perhaps may be put down to our characteristic conservativeness, as the late Wilfred Trotter of London has so aptly expressed it, "The mind likes a strange idea as little as the body likes a strange protein and resists it with similar energy. We shall often find that we have begun to argue against the new idea even before it has been completely stated". However, for some years now practically the whole world has accepted radium as the treatment of choice in cancer of the cervix.

In speaking of radium treatment, one recalls that though it was originally used alone and simply as a local application, now it is only one part of the radiotherapeutic approach to the problem. It is not possible for radium itself applied directly to the tumour to have a lethal effect on cancer cells beyond the radius of 3 cm. from the radium source, thus treatment by this means alone is doomed to failure in a large percentage of cases. The addition of deep x-ray therapy marked a further step forward in the treatment of cancer at this site.

In some clinics, notably the Radiumhemmet in Stockholm, teleradium therapy frequently replaces deep x-ray. Heyman believes the results to be more satisfactory than with x-ray, but no comparable statistics have yet been published. Clinical research work on the comparative merits of these two types of treatment for mouth cases has been going on for some years now in the London Radium Institute, and in the Chicago Tumour Institute; ten gram bombs are being used and the directors of both clinics are satisfied that radium used in this way has an important place in the treatment of cancer, and look forward to still further progress with new developments in the technique of treatment.

The latest advance in radium treatment of the cervix, as well as of other parts of the body, might be termed the bio-physical approach to the problem, *i.e.*, the attempt to assess accurately the dose of irradiation in terms of physical measurement. This first became urgent with the realization of the dangers of irradiation when delivered in too small or too large dosage,

and then possible with the growing knowledge of the physical and biological laws governing irradiation. The international adoption of the roentgen equivalent of 8.3 for the Sievert dose, *i.e.*, the dose of gamma irradiation received in one hour, at 1 cm. from a point source of 1 mg. of radium, with a filtration of 0.5 mm. of platinum, still further simplified the situation.

It had already been demonstrated that the gamma rays of radium could be successfully measured for surface and interstitial treatments, so clinicians and physicists now turned their energies to this more difficult problem of three dimensional measurement. Until quite recently the radium treatment of uterine cancer had been entirely empirical, though it had reached great effectiveness in the hands of skilled and experienced radiologists. These pioneers in the field of radium therapy learned through their own clinical work the possibilities, limitations and dangers of this type of treatment. This empirical treatment, based on practical experience, worked out well in clinics where one person was able to personally carry out or supervise all treatments. With the appearance of larger centres this became impossible and efforts were made to develop an accurate method of dosage which could be learned within a reasonable time and repeated from patient to patient and from clinic to clinic.

British clinics, notably the Royal Cancer Hospital in London and the Holt Radium Institute in Manchester, have been working on this problem for some ten years and routinely use methods of treatment based on such physical measurements. Mayenard and his co-workers at the London Cancer Hospital have solved spatial distribution problems by means of a contour projector and dose finder and have built up isodose surfaces for standard clinical arrangements of radium sources in the pelvis. Elizabeth Hurdon has considered the clinical significance of this work as applied to the techniques in use at the Marie Curie Hospital in London. Margaret Tod and W. F. Meredith have done similar work at Manchester, where ionization measurements have been made of different radium distributions in an artificial pelvis. There, radiographs are taken of each patient immediately after treatment in order to check the position of the radium; if points of very high or very low intensity are found, the distribution is changed.

H. M. Parker, who with Ralston Paterson initiated this work at Manchester, is now at the Swedish Hospital in Seattle. There he is working in collaboration with Cantrill, who reports the construction of a most ingenious model of the female pelvis made of layers of preswood 1 c.m. thick. These are removable and allow for the placement of a Victoreen chamber within the model at selected points, when measurements under treatment conditions can be made and isodose curves constructed.

Ideally of course, all radium treatments are carried out in collaboration with a physicist, but they can be reproduced with a reasonable degree of accuracy by means of dosage tables and these various mechanical devices. One great advantage of such work is that it can be developed and taught in large centres and carried out in much smaller places, with less equipment. The Holt Radium Institute in Manchester, under the directorship of Ralston Paterson, has become the recognized teaching centre of Great Britain for this type of work, and doctors from there can be found on the staff of many cancer institutes throughout the world, as well as in Great Britain. The Memorial Hospital in New York occupies a similar position on this continent and the work of Failla and Quimby is long since familiar to all irradiation therapists.

To consider the technique of radium treatment: originally radium alone was used and this form of treatment has been practised in Europe since 1906, though few clinics had adequate supplies of radium before 1913. The Stockholm and Paris Clinics were the first to stabilize their methods of treatment and to assess their results. The whole situation was reviewed at the First International Radiological Congress held in London in 1925. At that time it was found that these two clinics held the leadership in this type of work and that there was little to choose between their results. Regaud advocated continuous radiation at low intensity; Heyman, divided doses at relatively high intensity, delivered in two or three applications. Both the Paris and Stockholm schools still carry on with their original methods and practically the whole medical world follows one or the other. But it must be remembered that they are adaptable clinical procedures rather than fixed techniques. All the well established clinics have improved their results over the years, but the League of Nations work has demonstrated that no one method has been shown to have a definite superiority over any others.

My own experience has been largely with the Stockholm method and I shall briefly sketch the history of its development. Forssell first began the treatment of cancer of the uterus by the local application of radium salts in 1910, just over 30 years ago. At that time the quantity of radium used was very small, 10 to 20 mg., and the time of application short, rarely exceeding 20 hours. In cases which progressed favourably, the treatment was repeated a number of times at intervals of 3 to 6 weeks. It was hence a treatment of repeated small doses. When greater quantities of radium became available, larger doses were used and definite improvement was observed in the progress of healing. There were also fewer complications, such as widespread sloughing, or perforation of the bladder or rectum. By 1914

a very definite method had been evolved and with minor modifications is still in use today. Since that time, however, five-year results have been assessed at regular intervals and a careful attempt made, on different series of cases, to develop the technique in other directions. By 1936 some 3,000 cases had been treated, but observation over the years has shown that the only innovation that has had any material effect on survival rates is the use of deep x-ray therapy, or teleradium therapy in combination with the local application of radium. Throughout this development in treatment one very important principle was always maintained, i.e., the adaptation of the technique in each case to local circumstances. In order to carry out this principle there must be available a choice of radium containers of various forms and sizes.

Following this historical survey, may I describe the procedure we follow at the Cancer Institute in Vancouver, which is, as I have inferred, based on the Stockholm method. After the patient is admitted on recommendation of her physician, the history is taken and routine physical examination carried out. This includes a complete blood count, a Kahn test, and a cystoscopic examination, the last being carried out after the patient is admitted to hospital. A pelvic examination is then done in consultation with a gynaecologist on the attending staff. The anatomical extent of the disease is determined and the stage noted; if there is any doubt of the diagnosis a biopsy is taken, if not, this procedure is postponed until the first radium application.

If the cancer has progressed to stage 3 or 4, or if infection is present, deep x-ray therapy is given prior to radium treatment. If not, the first radium treatment is given. This is carried out in the operating room, usually under sodium pentothal anaesthesia. The cervix is dilated only to a No. 8 Hagar. Unnecessary trauma must be avoided, and for that reason curettage is not done routinely in cervix cases, and apart from the biopsy, no surgical procedure is undertaken, even in the presence of a large fungating growth. This type of growth rapidly disappears during radium treatment and is really the most satisfactory type to treat. It appears to be much worse than it actually is, and there is a gratifying element of magic in its spectacular disappearance. If a biopsy has not already been taken, this is done after the radium is placed in the uterine cavity, otherwise bleeding makes the application more difficult. Occasionally, it is impossible to find the cervical canal at the first operation; if so, the intrauterine application is omitted and suitable radium containers are placed in the vaginal vault against the cervix. The cervical canal will almost invariably be apparent at the second application.

The intrauterine radium is applied in cylindrical capsules made of silver, the so-called Clarke applicator. One to four sections are used, depending on the size of the uterus; 10 to 30 mg. of radium are placed in each section with a total of 40 to 80 mg. in the uterus; the filtration used is equivalent to from 1 to 1.5 mm. of platinum. London colpostats, bakelite containers lined with lead, or silver boxes, are used in the vagina and packed against the growth, and in the lateral fornices, where this is possible. Packing is a very important consideration, as it serves to maintain the distance of the radium sources from the bladder and rectum, as well as holding them in position. The containers are so constructed that a distance of 0.5 to 1 cm. is maintained between the radium and the tissues and the filtration equivalent is 1.5 mm. of platinum. The containers are left in position for 20 to 24 hours, depending on the amount of radium used. The usual single dose is in the neighbourhood of 1,000 mg. hours in the uterus and 1,500 in the vagina, the total dose being between 7,000 and 8,000 mg. hours. The dose is reduced for a very small pelvis or for senile atrophy.

After removal of the radium the patient is given a douche and an enema and is encouraged to get out of bed the day after treatment, in order to facilitate drainage. She is usually kept in hospital until the second radium application, which takes place a week after the first. The second treatment is substantially the same as the first, though slightly different arrangement of the radium may be desirable; even between these two treatments there may be a very definite modification of the growth. The third treatment is a repetition of the other two and is carried out two to three weeks after the second. At this third application there is usually a very material shrinking of the cancer and also a clearing up of any infection that was previously present. The dividing of the dosage in this way gives several distinct advantages: there is less danger of complications from pelvic infection and the dangers of hypostatic pneumonia, and of injury to the intestines, are practically eliminated. Another important advantage is the shrinking of the cancer between treatments, thus allowing a more effective application of radium. Reaction begins about two weeks following the first treatment and consists of a white membranous film, extending over the cervix and vaginal vault. This subsides in two or three weeks following the third treatment and reappears again during the course of the x-ray therapy. An obliterative endarteritis, with resultant ulceration and secondary infection, may be the late result of too vigorous treatment. This usually occurs six months to a year following treatment. Occasionally such late reactions may be mistaken for recurrences and treated accordingly, with disastrous results.

There are practically no contraindications to treatment. Palliation at least is nearly always possible. The important thing is to know when to stop; treatment should never be repeated within the first year if the maximum dose has already been given. Remnants of growth, or recurrent nodules in the vagina, may be implanted with radium needles.

I shall just mention in passing that Heyman has also developed a successful technique for the treatment of body cases and that in Stockholm radium has largely replaced surgery here, as well as in the treatment of the cervix. In collaboration with his physicist he has evolved a method of treatment which gives a homogeneous irradiation throughout the whole endometrium, the so-called "packing method". This completely fills the uterine cavity with radium capsules of equal size; the total dose is given in two treatments with an interval of three weeks, and varies from 2,600 to 4,000 mg. hours and the quantity of radium between 80 to 200 mg. These treatments are carried out by means of an applicator, which allows accurate placement of the radium throughout the whole uterine cavity, beginning with the two cornua. Because of the danger of metastases to the vagina at least one vaginal treatment is given. The patient is controlled by regular examinations, and if symptoms do not disappear, or if, after temporary cure new symptoms, such as bleeding or discharge or increase in the size of the uterus appear, a total hysterectomy is done.

To sum up—the radiation treatment of cancer of the cervix has been developing over a period of 30 years. Several factors have contributed to making it one of the most successful chapters in the radiation therapy of cancer; there are the favourable anatomic conditions such as the accessibility of the parts to be treated, which make possible the accurate placement of radium; again, the wide range of radiation tolerance of the pelvic structures makes the margin of safety between a lethal and necrotic dose wide, and purely cosmetic results may be disregarded. Thanks to the work of the League of Nations, an international approach to the problem has been possible. Different clinics have developed

different methods of treatment. Several of these methods have stood the test of time, but no one method has been shown to be superior from the point of view of survival rate; the most important consideration is still the stage of the disease. The best results are obtained in clinics where all treatments are supervised or carried out by one man, and this demonstrates the im-

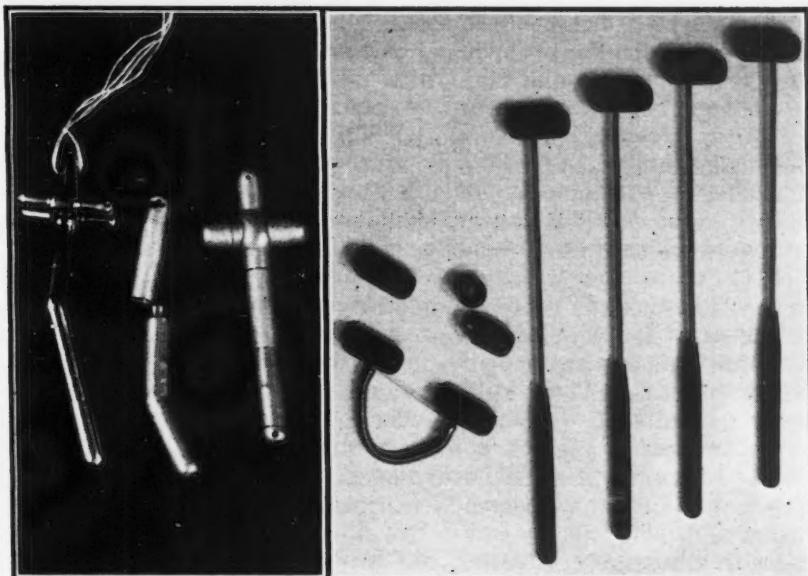


Fig. 1.—Clark applicators.

Fig. 2.—London colpostats.

portance of a permanent staff and co-ordinated teamwork. This is only possible when the work has been centralized.

May I conclude this brief review of radium treatment of cancer of the cervix by quoting Heyman himself:

"There was a time when it was believed that it should be possible to simplify radium treatment to such an extent that it could be practised according to given rules by anyone who had access to the necessary quantity of radium. We, ourselves, have had to relinquish this ideal. In order to obtain satisfactory results it is not sufficient to be familiar with the technique of radium application, in itself usually a simple operation, but it requires a careful planning of the treatment for each individual case, an estimation of the factors of influence, recognition and understanding of the variations in the healing process, and insight into the dangers and complications. It demands, in other words, the knowledge, which only experience can provide and which even in radiological treatment distinguishes the craftsman from the artist."



Men and Books

HUMAN LONGEVITY

BY H. E. MACDERMOT

Montreal

The current literature on old age concerns itself more with the problems of threescore years and ten than with the possibility of life being prolonged beyond the century mark. Older writings, however, paid more attention to recording instances of extreme old age, and to speculating whether life could be extended even further than these exceptional examples.

Possibly one reason for this change in outlook is due to certain inquisitive men who have shown that there is no reasonable proof in most of the cases for which excessive age is claimed. Not that this healthy scepticism has been altogether effective. There still appear in the daily press accounts of individuals who are said to have lived many years beyond one hundred, in which the spectacular nature of the case receives more attention than does the evidence as to its authenticity.

As in all such curiosities, one finds certain especially notable instances which tradition has established on apparently unshakable foundations. Putting aside the so-called antediluvians—Methuselah, and so on—the name which most frequently is quoted in the literature on these super-centenarians is that of the famous Thomas Parr. Not only is he placed in the upper brackets of years, his alleged age being 152 years, but the evidence on which the claim is based contains just enough likelihood of authenticity to have given it respectability for many generations. Whilst in no sense an instance of this respectability it may be recalled that in our own time the odour of sanctity which clings about “Old Man Parr” has been yet further reinforced by the naming of a certain brand of whiskey after him.

Thomas Parr is said to have been born in 1483. In 1635 it happened that the Earl of Arundel in visiting his estates in Shropshire near Parr’s birthplace “had the report of this aged man (then supposed to be 152) certified to him”. Whereupon the Earl had him sent up to London in a litter, where he was presented to the king and entertained with such festivities that he died a few months later.

On the day after his death an autopsy was performed on him by William Harvey, who gave a detailed account of what he found.* It is this autopsy which has for so long been taken as an endorsement of the claim for Parr’s age, and there is no doubt that its descriptive details are

accurate. Nowhere in it, however, does Harvey say that he had verified the age. He merely took the statements of others on that point. Also, apart from the fact that the autopsy findings could not establish the age accurately, Harvey’s comment on the remarkable state of preservation of the organs could just as well be taken as proof that Parr was not as old as was claimed; he says:

“All the internal parts, in a word, appeared so healthy, that had nothing happened to interfere with the old man’s habits of life, he might perhaps have escaped paying his debt due to nature for some little time longer.”

When the evidence is further examined, it appears that Parr was presented to the king by the Earl of Arundel as “an old, old, very old man”, but the noble lord had no proof of the age beyond the mere statements of others. It is also true that a life of Parr was written by one John Taylor—the so-called “Water Poet”, because he had been a waterman on the Thames—and in this the various incidents of Parr’s life are set forth (largely in doggerel verse), with confirmatory dates which taken together account for the assigned age of 152. But these biographical details were supplied either by Parr himself, in his latest years, or by Taylor’s imagination.

What most impresses the public mind, however, is the tablet to Parr in Westminster, with the inscription recording that he had lived in the reigns of ten princes, and that he was aged 152. This proves nothing in itself; the Abbey’s records do not even contain an entry for the burial.

There is no doubt that Parr was a very old man; he may well have lived to a hundred, or even a year or so more, but there is not a single particle of evidence in proof of his having reached such a great age. This is the conclusion reached by W. J. Thoms, in his book “The Longevity of Man” (London, 1879), which contains an exhaustive inquiry into the matter.*

Thoms also deals with the famous case of Henry Jenkins, an illiterate farm labourer who is alleged to have died at the age of 169. Here again the claim is shown to rest entirely on hearsay and repetition of what Jenkins himself said. He gave evidence, for example, in 1670, the year of his death, that he well remembered carrying arrows up the hill to the soldiers at the Battle of Flodden Field in 1513, but the statement is more dramatic than it is credible. He too, has a monument, in Bolton churchyard, where he is buried. The inscription reads in part:

* This has been one of my main sources of information, and I am greatly indebted to Dr. W. W. Francis for drawing my attention to it.

* Works of Wm. Harvey, M.D., Sydenham Society Edition. Translated from the Latin by Robert Willis, 1847, p. 587.

"Blush not marble, to rescue from oblivion the memory of Henry Jenkins, a person obscure in life, but of a life truly memorable, for he was enriched with the goods of nature, if not of fortune . . . and though the partial world despised and disregarded his lone and humble state, the equal eye of Providence beheld and blessed it with a patriarch's health and length of days, to teach mistaken man these blessings are entailed on temperance, a life of labour, and a mind at ease. He lived to the amazing age of 169, was interred here December 6, 1670, and had this justice done to his memory, 1743."

Next in order of notoriety is the Countess of Desmond, who is said to have died of a fall from a cherry tree at the age of 140. Little wonder that she was called a "frisky old girl" by Thomas Moore. There is as little authenticity in her case as in those of the other two. It may be remarked, however, that she is apparently the only instance in which such excessive age has been assigned to anyone of high social standing. There seems to have been a general understanding that fabulous age was a reward only to be attained by those in poverty.

Now, if such venerated examples of extreme old age can be dismissed as exaggerations it seems hardly worth while examining other claims even less capable of investigation. Galen, for example, is said to have reached the age of 140. Hippocrates, with more reason, perhaps, is assigned the age of 104. But these stand as mere boys beside the case described by the Portuguese historian Maffens, of one Numas de Cugna, a native of Bengal, who died in the year 1566 at the age of 370!* This gentleman is said to have been "quite illiterate, but with a wonderful memory". He had had four new sets of teeth, and in the course of his life was asserted to have had 700 wives. Another instance, given in some detail, is that of M. Krasovina, born in a Polish village, who stated that at the age of 94 she married her third husband, Gaspard Raykott, who himself was 105. This happy union produced two boys and a girl, "and what is more remarkable", the account goes on, "these three children bore evident marks of the old age of their parents, their hair being grey, and a vacuity in their gums like that which appears after the loss of teeth, although they never had any . . . Their backs were bent, their complexions sallow, and they had all the other signs of decrepitude. Though most of these particulars may appear fabulous, they are verified by the parish registers."†

These last two examples illustrate two points not infrequently noted in connection with those credited with excessive age; they were illiterate, and, the higher the age recorded the more obscure was the birthplace. Some special virtue seems to have been attached to illiteracy in the prolongation of life.

* Referred to, with excusable incredulity, by James Easton in his book an "Human Longevity", 1799. But Mr. Easton accepts other prodigious ages without question.

† *Ibid.*

There is no question that many people have lived for more than one hundred years; but not for much more, and, as will be shown later on, the recorded number even of those with a span of a century can be greatly reduced by careful scrutiny. One of the interesting points about the various investigations into these cases of longevity is the care and ingenuity with which the evidence is examined. Naturally, the most important proofs are the birth, marriage, and death certificates, including those of the rest of the family; the least important are inscription on tombstones, or "authentic" statements made by friends or relations.

Now, even birth certificates should be very closely examined. John Jones the centenarian is not necessarily the individual recorded in the register of his village church more than one hundred years before. Many families have the custom of perpetuating a family name. The first child to bear the name may die, and the favoured name is then given to a succeeding child. It is quite possible for the individual who reaches the old age mark to be the third of that name in the family, and his birth certificate may be confused with that of the first-born who died, making just the difference in years that unseats him from his tottering hundred plus to the more juvenile and much more ordinary nineties. Many such cases of mistaken identity are recorded.

The marriage certificate may provide additional details of great value. The death certificate is also important, but of course must be taken in conjunction with the birth registration.

Inscriptions on tombstones are obviously of very little value in themselves. As Dr. Johnson remarked, with his usual penetrating common-sense, "In lapidary inscriptions a man is not upon oath". I have instanced Thomas Parr's memorial tablet in Westminster Abbey. There are others similarly open to doubt, although in some the error is gross in nature. In Chave Priory, Worcestershire, for instance, one villager's age is recorded on his tombstone as 309, which is known to have been the attempt of an uneducated workman to chisel the number thirty-nine. Even worse is the case of the maiden lady whose age is shown as 708, by a village mason who wished to record seventy-eight.

Altogether, then, it is clear that the verification of the age of centenarians is no simple matter, and involves much more work than most people care to expend on it. Perhaps one of the soundest inquiries of this kind is that by Thoms, to which I have already referred. Thoms was deputy librarian of the House of Lords, and he undertook his investigation as something of casual interest, but soon found himself involved in unforeseen labours. "Let no one", he says, "who has the slightest desire to live in peace and quietness be tempted, under any circumstances, to enter upon the chivalrous task of trying to correct the popular error". In the

course of his researches, however, he refers to some others which concern us more nearly, since they were carried out in the Province of Quebec.

These inquiries are embodied in the fifth volume of the official statistics of Canada, published in 1878, as a "Summary of an Investigation into Centenarianism", and it stands out as an extremely interesting piece of work among the details of an otherwise typically dull official record. The author of this gratuitous, even unique labour (for surely no other census report has ever gone out of its way to verify the ages of centenarians) is Dr. J. C. Taché, the head of the Statistical Department at Ottawa at the time. He gives full credit to M. l'Abbé Tanquay, the first genealogist of Canada, for his part in what was truly a gigantic task; and also to the parish priests of the province for help in consulting the parish registers. Incidentally, it may be remarked that Quebec possesses population records of which it may well be proud, since they extend back uninterrupted to 1608.

The censuses in question, however, cover the entire eastern section of Canada, from Ontario to Nova Scotia, up to 1876. Dr. Taché made it his business to collect a complete list of all those in Canada who were reputed to have reached the age of 100 or more, using not only the censuses themselves, but all other available sources, such as the journals of the day, books, and parish registers. From these sources he succeeded in bringing together a grand total of 421. It is with this group that his report is concerned.

First of all, he found that most of these people had been born outside of Canada, and that with only a few exceptions their antecedents could not be traced. There was seldom any proof of their age, except the blunt assertion that they had lived for a hundred years or more. The greatest age thus claimed was in the case of a woman of French origin who was supposed to have been born in Canada and who died in the State of New York at the reputed age of 130. Not even a semblance of proof of her age was adduced by the journal in which it was recorded.

It was therefore possible to discard the majority of the group without much question. Dr. Taché's inflexible demand for accuracy led to still further reduction of the now much shrunken list when he came to compare the various censuses in which some of these alleged centenarians appeared. He found by this method that in many cases the age had increased by more than ten years during each ten-year period. Sometimes fifteen and even twenty years were added at each successive census; in one instance the individual had increased his stated age by thirty-one years in the modest space of ten!

The rigours of this qualifying round of investigation were surmounted by only a compara-

tively small band of survivors, 82 in all, and it was on these that the real labour of verification was expended. With but one exception, these were all natives of the Province of Quebec, again bearing witness to the completeness of the Quebec population records. This one case was that of a farmer named Descombes, who received a biographical notice at the time of his death in *Le Journal de l'Instruction Publique* in 1858, to the effect that he had lived to the age of 112. That would have made the year of his birth 1746. His birth certificate was not immediately available, but the record of his marriage was found to contain the names of his parents and of his parish of birth, which was in Bordeaux, France. These details were followed up and verified at the Mairie of Bordeaux, and they revealed that he had been born in January, 1777, thus reducing the age to a humble 81.

By the time that Dr. Taché and his colleagues had completed their investigations there was not much of the group left. Only nine of them were accepted as centenarians or better, that is, 2.13 per cent of the original list of 421, and 10.97 per cent of the selected group of 82. In three instances, oddly enough, the age was established as being really greater than had been claimed, an indication, if one were needed, that the inquiry was strictly impartial. One of these was Pierre Joubert, a shoemaker, born in Charlesbourg, who had given his age as 105, but was shown by the records consulted by Dr. Taché, that is, his birth, marriage, and death certificates, to have been actually 113. Mr. Thoms regretfully finds himself unable to accept this conclusion, even from Dr. Taché, for whose judgment and integrity he had the highest respect. He suggests that there must be some undetected and unsuspected error.

The other two cases were farmers, from Sorel and St. François du Lac, respectively. Both had claimed to be 100, and one was found to be 103 and the other 102.

A certain Rosalie Lizotte, of St. Roch des Aulnaies, had said that she was 109, and this was proved to be correct by Dr. Taché. She was the ninth of fifteen children, and was born, as shown by her birth registration, in February, 1738. She was married twice, the first marriage being duly recorded, with her age, but not the second (one of the very few gaps found in the registers) and was buried in Rivière du Loup in March, 1847. In spite of this circumstantial evidence Mr. Thoms again expresses hesitation in accepting the conclusion reached by Dr. Taché.

Many in this group of 82 had their claims sharply reduced. Four were reputed to be 110, and were shown to be 92, 94, and 98, respectively, whilst the fourth was admitted to have reached 101. The sole claimant to 112 was found to have been only 81. One lady, Marie-Angélique Gouge, of Pointe-aux-Trembles, who gave her age as 100, was proved to be only 79.

One case of particular interest was that of Françoise Lecompte, widow Dupil, who was said to have been 110. The incident which was held to lend special confirmation to this, was that she had been visited at her home on the Island of Orleans by His Royal Highness the Duke of Kent, then in garrison in Quebec (1791-1794), and that she had then requested and obtained the favour of dancing a minuet with the son of her king, to prove how nimble she was, though so much past her hundredth year. Dr. Taché, however, was able to show that she was born in 1699, and as her death took place in 1793 (not long after the minuet!) her age of course was really only 94. Even so, the circumstances, as Dr. Taché remarks, "distinguish the anecdote from the commonplace".

It is admitted that many of these errors in estimating the age were probably committed in good faith. Several even were based on authentic records, honestly interpreted, but about which mistakes of identity had occurred. A goodly number, however, were prompted by the perhaps excusable vanity which impels old age towards exaggeration of its tenure of life. In one case at least, imposture was practised and exploited. This macrobite was not in Dr. Taché's collection, as he was still alive in 1876, but he was well known at that time as claiming to be of some preposterous age, deriving therefrom revenue and continual support. He always displayed an authentic copy of his birth certificate, in which however he had altered the two last figures of the date. Justice overtook him when a local paper reproduced this certificate and thus brought it to the attention of the parish priest who had certified to its authenticity before the falsification. He naturally protested against being associated with fraud, and the alleged centenarian had to desist from his imposition.

To this may be added the case of Zaro Agha, the Turk, who toured North America with a manager in 1934, as one who had by means known only to himself lived to an age far beyond one hundred. He was never exposed as an impostor during his lifetime, but there is evidence now to show that he was actually only 97 at the time of his death. (In the best tradition of these veterans he died quite soon after his tour!). However, it is likely that he will find his place amongst the other legendary figures of the kind, especially since the municipal council of Istanbul have declared their official belief that he was 157. The usual marble tombstone also has been accorded him, with its seal of inaccuracy.

A final source of inquiry into centenarianism which may be mentioned is that of life insurance and annuity records. The statistics of the mortality experience of such companies naturally do not go back much more than 125 years, nor would they in any case be expected to give much information on the highest age reached by human beings. Very seldom indeed do people

pay premiums and remain under observation by insurance companies after the age of 85, and as many companies pay the face amount of the policy when the age of 96 is attained the need to verify higher ages becomes very slight. Still, such data on the very aged as are available from insurance records are of great value because of their virtually indisputable proof of fact. These data have been studied by T. E. Young in his book "On Centenarians" (1898) and his findings support the view that human life is only very rarely prolonged beyond a hundred years. He does record one annuitant, however, a woman, who reached the age of 105; in a later edition of his book (1905) he quotes two other instances in which he is satisfied that the ages were 108 and 109. Mr. W. G. Bowerman, an actuary, states that "Up to the present (1939) the oldest known age attained by an insured life or annuitant in Great Britain or America is 107 years."*

There is then abundance of evidence to show that the extension of life beyond the century mark is very unusual. Further research may possibly bring to light proved instances of even greater age than those now accepted, but they should be accompanied by conclusive evidence.

Medical Relief Fund for Great Britain

Additional Subscriptions

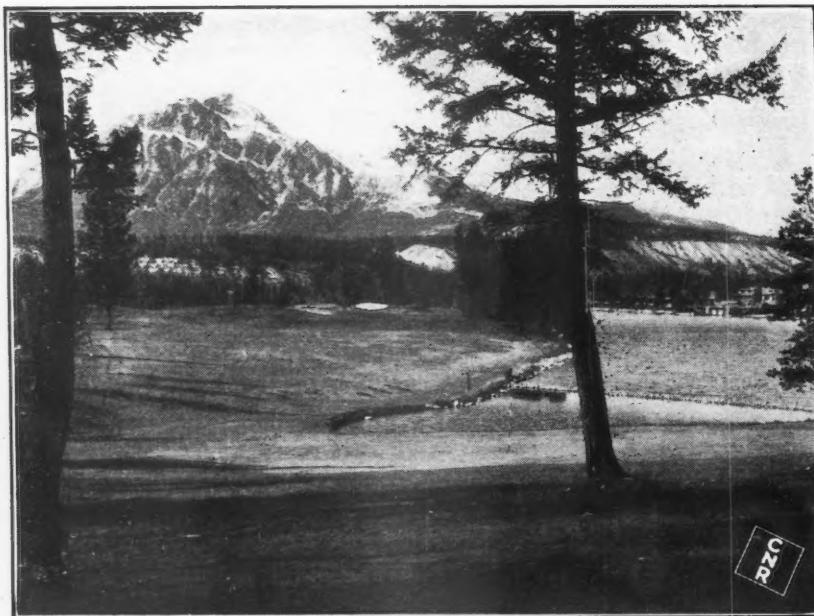
Additional subscriptions to this Fund are: Victoria County Medical Society, Lindsay, second subscription \$45.00. Individual subscriptions from Quebec are \$10.00, and from Saskatchewan \$200.00.

We extract the following from the *Bulletin of the Vancouver Medical Association*:

We note with great pleasure that one of our members, Dr. C. T. Hilton, of Port Alberni, has just sent in his *third* cheque to this fund. It is evidently becoming a habit with him, and we congratulate him on the fact. It would be a very good thing if more of us did the same thing: many of us could afford very well to make this one of our main outlets for self-expression. Another member, Dr. J. T. Wall, is also to be congratulated on having made a second contribution to the Fund.

* *Transactions of the Actuarial Society of America*, 1939, vol. xl., p. 363.

Association Notes



Jasper Park Meeting, June 15-19, 1942

Plans for the next annual meeting are progressing favourably. The Local Program Committee in Edmonton has rendered splendid assistance to the Central Program Committee. Approximately 100 invitations to speakers have been sent out and acceptances are coming in daily. All booths but one in the Commercial Exhibition have been sold.

Pyramid Mountain, Jasper National Park, a beautiful peak whose slopes, shot through with browns, maroons, purples, blues and reds, may be clearly seen from Jasper Park Lodge. Good motor roads enable the visitor to Jasper Park Lodge to drive to the foot of this majestic mountain.

Hospital Service Department Notes

Hospitals Affected by Federal Control Measures

Hospitals throughout Canada, and their staffs, are affected to a considerable extent by the various control measures taken at Ottawa but, owing to certain exemptions to charitable institutions, they will not be affected to the same extent as will industry at large.

Room rates.—Charges for rooms have been fixed as of the period September 15 to October 11, 1941, by the Administrator of Services, Wartime Prices and Trade Board. Although most hospitals are providing several types of accommodation at much less than cost, such services must be maintained and without lowering the quality of the services. Increased charges will be permitted only after individual permission by the Board. How hospitals without reserves can continue to operate at a loss is not stated.

On the other hand, the rates charged for "extras" have not been fixed to date.

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

Wages and salaries.—Public hospitals are not required to pay the cost-of-living bonus (Order No. 8253). Many, of course, have voluntarily given an equivalent increase to their employees to permit the latter to meet rising costs. This is permitted by the fact that the same order, which is administered by the National War Labour Board, exempts public hospitals from the restriction prohibiting an increase in wages to those not above the rank of foreman. In other words hospitals can increase the wages of employees comparable to a foreman or one of lower status.

As for those on *salary*, the Income Tax Division of the Department of National Revenue, under which department this classification falls, has ruled that hospitals are exempt from P.C. 9298 only if they are agencies of a province or municipality; that is, if such province or municipality bears the operating deficit. By this order all other hospitals, as in the case of industry at large, cannot increase salaries after November 6, 1941, unless there has been a bona fide promotion. A person on "salary" is one over the rank of foreman or comparable rank; if there is doubt or no specific decision by the Board, a total salary of more than \$250.00 per month shall be considered as defining this status.

Priorities.—In December representatives of the Canadian Hospital Council interviewed officials at Ottawa respecting the possibility of priority ratings for hospitals in making necessary purchases, now so difficult to obtain. They were informed that Ottawa does not look with favour upon the priority system, which has been found to have distinct disadvantages as experienced in the United States. Federal officers, however, indicated their full appreciation of the necessity of maintaining civilian hospital services and agreed that urgent requests from hospitals would have immediate and sympathetic consideration. At the same time it was pointed out that non-essential purchases would not be given preference and that hospitals and their staffs must be prepared to curtail purchases to the minimum. Hospitals needing prompt delivery of equipment or supplies may write to the Priorities Branch, Department of Munitions and Supply, *giving full particulars.*

Cotton goods.—In recent weeks many hospitals have had much trouble in obtaining sheeting or other cotton supplies. This has been taken up with the Board and with the Cotton Controller. Although the situation is acute, assurance has been given that hospital needs will be given prior consideration.

Rubber goods.—Although the use of rubber has been greatly restricted, rubber required for "medical, surgical and laboratory supplies" will be available up to 50 per cent of the normal demand.

Metal goods.—Effective March 31st, a wide variety of metal articles used in hospital offices, patients' rooms, and elsewhere will not be available. Metal beds and other essential articles will probably be obtainable by hospitals.

Drugs.—Hospitals experiencing difficulty in obtaining drugs could make application on Form P.D.1, supplied by the Priority Branch, D.M.S.

Motor cars.—It is anticipated that doctors will be able to purchase new cars, although the number available will be quite limited. New tires will be available to doctors also.

Importations from the United States.—For some time hospitals have had difficulty obtaining American-made articles because of inability to supply a United States priority rating to the American manufacturer. Ottawa has been negotiating with Washington on this point and an early solution is hoped for. Meanwhile hospital

administrators desiring to make American importations can obtain forms from Mr. W. E. Uren, Executive Assistant to the Director General, Priorities Branch, D.M.S., Ottawa. Such forms, if approved, would facilitate clearance at Washington, but it has been made clear that Ottawa will only approve orders that are obviously essential.

Instalment buying.—Order No. 75 (which, by the way, replaces an earlier Order No. 64) outlines the restrictions on *consumer credit*. This requires a down payment of 50 per cent on motor cars and of 33 1/3 per cent on a long list of other articles; the balance is to be paid in 12 months, except for an 18 months' period allowed for cars worth \$500.00 or more. Many of the articles listed are "for household use" which has been ruled as not applicable to hospitals. Purchases by the hospitals which come under this heading, however, include window blinds, clothing, electric fans, portable heaters, electric pads, radios, tires and tubes.

Items not listed in this Order, as, for example, sterilizers or x-ray equipment, may be purchased on any terms suitable to the dealer and the hospital.

Dealers cannot continue to give credit on the items listed if payments lag behind the limits set, unless a satisfactory adjustment of these accounts be made. This could be an extension, a revision or a renewal.

Patients' charge accounts do not come under the restrictions of this Order. In other words, patients cannot be required to pay so much down and so much a month.

Food and other licences.—Although public hospitals do not come under Order No. 63, *Respecting Foods, Feeds, Clothing and Footwear*, the Director of Licensing of the Wartime Prices and Trade Board has strongly urged hospitals to make application for licensure. This is to avoid unpleasantness and delays in obtaining supplies from supply houses which now routinely require a licence number with every order. As hospitals purchase a wide variety of articles, they have been advised to indicate these various types of purchases under the different headings on the licence application form.

The Department of Hospital Service will endeavour to assist any hospital in the clarification of these many and somewhat confusing regulations.



The War

Second Canadian Division Medical Society

The third meeting of the CII Medical Society was held in the Officers' Mess of 10 Canadian Field Ambulance, R.C.A.M.C. on November 18, 1941. The following distinguished visitors were present: Colonel E. A. McCusker, M.C., Lieut.-Colonel L. C. Montgomery, M.C., V.D. and Lieut.-Col. W. MacKay.

The speaker of the day was Lieut.-Colonel L. C. Montgomery. Colonel Montgomery humorously explained that as he had learned on good authority that he was chosen on the third and last attempt to get a speaker for this meeting, his subject for the afternoon would be "mill run", and "mill run" it was. As far as the acting secretary was concerned, it ran far above his capabilities of keeping up, and in order not to miss a very interesting and instructive talk, he sat and listened.

Colonel Montgomery illustrated his talk throughout with x-ray plates, and demonstrated lobar pneumonia, bronchial pneumonia, the so-called "atypical pneumonia", bronchitis, bronchiectasis, aortic aneurysm, gastric ulcer, and duodenal ulcer. He discussed very fully "atypical pneumonia", which may be designated by any one of twelve or more descriptive nomenclatures, and gave a very interesting and differential diagnosis between this clinical entity and epidemic influenza.

The President then called on the Honorary President, Colonel C. P. Fenwick, M.C., to make a presentation to the Society. Colonel Fenwick asked the meeting to recall his remarks at the inauguration of this Society, when he had stated that many good friends of the Society, outside the medical profession would follow its development with interest. One of these friends today made it possible for the Society to have a Library made up of some forty volumes of the most recently published works in Medicine and Surgery. He had great pleasure in presenting this Library to the CII Medical Society on behalf of the donor, Mr. J. P. Bickell, in whose honour it was to be named "The CII Medical Society J. P. Bickell Library".

Colonel Fenwick then presented to the Society a beautiful hand inscribed banner bearing the R.C.A.M.C. crest and the Divisional insignia, a gift of Miss Miller of Hobson & Sons, London. The President expressed sincere appreciation on behalf of the Society for two such marvellous gifts and instructed that letters suitably expressing same might be forwarded to the donors.

Movement of adjournment was then made by Lieut.-Col. Haszard and seconded by Major Fish.

T. M. BROWN, MAJOR, R.C.A.M.C.,
Secretary-Treasurer,
CII Medical Society.

Orthopaedic Unit for Scotland

We learn that an orthopaedic unit for Scotland has been organized in Toronto and sent across.

Dr. A. B. LeMesurier was in charge. He had with him the following orthopaedic personnel. Dr. F. R. Wilkinson who is a well trained orthopaedic surgeon and who has been doing special work in acute infections in bones and who is an authority on the surgical use of the new drugs. Dr. H. H. Campbell who is well trained as a general surgeon and as a nose and throat surgeon and who has just completed a year and a half in training as a plastic surgeon. Dr. L. M. Hampson is a well trained and experienced anaesthetist and is an expert in photography. Drs. Kellam, Stirritt, Wilson, Sparkes and Megoe are recent graduates who have had two or more years as surgical interns.

Twenty-one nurses under the charge of Miss Alice Hunter comprised the nursing personnel.

Selection of Medical Officers

On October 25th, the Honourable the Minister for Defence (Air) met the Committee of the Canadian Medical Association to discuss the enlistment of Medical Officers for the Royal Canadian Air Force. The Director of Medical Services R.C.A.F. was present.

It was pointed out to the Minister that indiscriminate selection of approved medical practitioners would lead to the neglect of the requirements of the civil populace. It was agreed that this position had already arisen and that it was likely to be still further aggravated without proper co-operation. The Minister consented that steps be taken to abort the occurrence of any dislocation of civilian medical attention.

To this end, principal Medical Officers will, in future, get into contact with the various Provincial representatives of the Canadian Medical Association. All applicants will be discussed as to the desirability of taking them away from their practices, whether their civil services are considered indispensable and whether the civil population will be robbed of proper medical supervision. This consultation will not be limited to medical practitioners in towns and country but will apply also to doctors in hospitals and institutions.

Where an applicant has not already completed and filed a questionnaire card with the Canadian Medical Association, opportunity should be afforded the Provincial representative to contact the applicant and state a case before acceptance.

It is the hope of the Canadian Medical Association that a proper approach and explanation may persuade the applicant that duty can be as important in a civilian capacity as in the Service. The Committee informed the Minister that they had no desire to act as selectors of

service personnel but hoped, by liaison, to assist in solving the difficulties which are arising in connection with the medical care of civilians.

The names of the representatives are as follows: No. 1 Command, Dr. Harris McPhedran, Medical Arts Building, Toronto. No. 2 Command, Dr. O. C. Trainor, Medical Arts Building, Winnipeg. No. 3 Command, Dr. F. S. Patch, 1225 Bishop Street, Montreal. No. 4 Command, Dr. A. W. Argue, Grenfell, Saskatchewan. W. Air Command, Dr. Murray Blair, 718 Granville Street, Vancouver. E. Air Command, Dr. J. R. Corston, 46 Coburg Road, Halifax.

Questions from Medical Students

[The following are some of the questions put to the General Secretary after he had addressed medical students in two Canadian Universities on the subject of their subsequent relationship to the war.]

1. If the Government wants medical students to proceed with their courses to graduation in order that they may become Medical Officers, why do they ask medical students to take O.T.C. training?
2. If all the oncoming graduates who are fit are to be urged to join the Services, what pressure is being put upon the medical men who have been out four or five years, to join the Services?
3. What percentage of medical graduates in Canada of the past five years have enlisted? How does this percentage compare with enlistments of medical men in the higher age brackets?
4. Should men who have obligated themselves to do a twelve months' internship break that at the end of eight months and enlist?
5. Will an eight months' internship be accepted after the war as the equivalent of a twelve months' internship, by licensing bodies both in Canada and the United States?
6. Has the Army, Navy, and Air Force agreed to accept an eight months' internship as satisfying their requirements where it is stated that a twelve months' internship is required?
7. Why is it necessary to appeal to the oncoming graduates to join the Services?
8. Is the Canadian Medical Association trying to persuade all present doctors in practice who are fit to join the services when they are needed?
9. What arrangements is the Association making for internships following the War, especially for the young men who are deprived of these internships because of the War?
10. If doctors are so badly needed in the War, why do you ask us to take an internship

at all? Why could not that be deferred until the War is over?

11. Are the Government Services co-operating fully with the Canadian Medical Association in the selection and placing of medical personnel?
12. What authority has the Canadian Medical Association in respect to the placing of medical personnel?
13. Does the Canadian Medical Association speak to us with the full authority of the Departments of Government concerned?

The Home Guard Medical Officers' Course [Great Britain]

The Home Guard Medical Officers' Course lately held at Cambridge was productive of many surprises, both major and minor. Among the latter was the discovery that afternoon tea is not served in Cambridge on the Sabbath. One of the pleasant surprises was the enormous usefulness of the course, which the bald syllabus had rather concealed by its copious use of incomprehensible initials, and the high grade of oratorical ability. Another was that even those of us whose limbs had lost their primal elasticity came successfully through a course which made no small calls on our endurance. It was long, it took no count of Sunday as a day of rest, but its interest sustained us so effectually that even when official lectures were at an end (and one of these began at 9.30 p.m.) we indulged in long discussions of our own (held, I must confess, in a common-room happily provided with malt liquors).

The object of the course was not so much the instruction of Home Guard M.O.s in their duties, although this was not entirely omitted, as the provision of a background which would inspire us with the urgent need for the energetic fulfilment of those duties. This background was sketched in by various techniques. We were lucidly instructed in the nature of an infantry division, its component parts and their several functions. Then the size and usefulness of an armoured division were laid before us, with full attention to its own particular difficulties, including, for example, the method of removing casualties from tanks, as well as the ways in which it was possible to compensate for the striking contrast between the highly mobile armoured vehicle and the would-be static casualty. The functions of the field ambulance were perhaps too lightly passed over and this is a point which might be elaborated in any future courses. We shall often have to make contact with such units and it would be well if we knew more about them. We were then treated—it was a treat—to a series of lectures by specialists on methods of attack and defence, including the latest information on gas warfare, the offensive use of the tin helmet, and the psychology of the German war machine. Two points were regarded as axio-

matic by all speakers. The first was that invasion, including gas attack, was the logical development of the German war plan and that it was certain to occur unless a miracle happened on the Continent. The second was that, in case of invasion, the complete isolation of territorial units of various sizes for not less than seven days was to be expected. In other words, there would be no ambulance service to such units for this period. It is an important feature of the invasion picture that these areas cannot be foretold beforehand, and will not necessarily be those in which preparation for isolation has already been begun. Which areas will finally be isolated depends more on the German general staff than on our own.

Then we got down to our own special affairs. Only one lecturer, or perhaps two, seemed to have any close acquaintance with the actual problems of Home Guard medical officers or even with the possibilities of the fighting Home Guard. We listened many times to detailed instructions about the use of facilities and equipment which we are never likely to possess. We heard almost nothing of how we might best make use of the rather meagre facilities afforded us, both in the training of Home Guard volunteers and in equipment. These facts made a lecture on Home Guard tactics by the commanding officer of a Home Guard battalion tremendously welcome. It was a fine lecture and was one of the four which might have been expected to obtain most marks if we had been asked to vote on them. Three others came near the same mark. One of these, and this was another surprise, was the lecture on war surgery. Many books have been written on this subject but they have not been written for us. This lecture, by a consulting surgeon, dealt with stark realities in and near the front line. We were encouraged to make known our own difficulties, and even to pass resolutions to be put before the proper authorities. We learnt much; maybe we also taught a little.—From "In England Now", *The Lancet*, 1941, 2: 380.

Lists are being compiled by the Association of all interns in Canada. They are to be approached through the Divisions as part of our policy of co-operation with the military authorities in securing medical personnel. Surgeon Rear Admiral Gordon Gordon-Taylor told us that the Motherland would welcome most heartily eight hundred doctors from Canada if they could be spared. The whole situation is being reviewed by the Canadian Medical Advisory Committee of the Association.

Medical boards, as requested by the Department of National War Services, have been established in towns and cities throughout Canada. The nine Divisions have co-operated most effectively in this undertaking.

War Literature

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 Sulfanilamide in Local Treatment of Skin Infection, A. G. Marshall, 1941, 2: 544.
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 Streptococcal Ulceration around Wounds (leading article), 1941, 2: 553.
 The Army Medical Officer, J. T. Robinson, 1941, 2: 555.
 The Treatment of Gas Casualties (correspondence), 1941, 2: 559.
 Treatment of Hallux Valgus in Soldiers, R. Brooke, 1941, 2: 605.
 Closed Plaster Treatment for Burns of Extremities, T. J. Roulston, 1941, 2: 611.
 Economy of Dressings (leading article), 1941, 2: 619.
 Night Blindness (leading article), 1941, 2: 420.
 The Organization of an Ear, Nose and Throat Department in the Emergency Medical Service, V. E. Negus, 1941, 2: 519.
 The T.N.T. Health Hazard, H. M. Roberts, 1941, 2: 647.
 Methods for the Local Application of Sulfanilamide, Frank Hawking, 1941, 2: 685.
 Failure of *in vitro* Tests as a Guide to the Value of Stored Blood, P. L. Mollison and L. M. Young, 1941, 2: 797.

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Traumatic Asphyxia, J. G. Bonnin, 1941, 2: 333.
 Blast Injury of the Lungs, J. N. O'Reilly and S. R. Glynne, 1941, 2: 423.
 Temporary Immunity against Influenza (annotation), 1941, 241: 457.
 Sources of Vitamin C (annotation), 1941, 241: 457.
 Radium Therapy in Wartime, M. Lederman and W. V. Mayneord, 1941, 241: 461.
 German Views on Blood Transfusion (annotation), 1941, 241: 533.

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Some Aspects of Wound Shock, with Experiences in Treatment, W. d'A. Maycock and L. E. H. Whitby, 1941, 77: 173.
 Plan of a Tented Field Operating Theatre, H. S. Shucksmith, 1941, 77: 201.
 A Device for Raising Injured Limbs whilst Casualties are Removed on Stretchers, F. G. Cawston, 1941, 77: 218.
 Dyspepsia in the Forces, H. L. Tidy, 1941, 77: 113.
 Acuity of Hearing in Searchlight and other Personnel requiring Good Hearing, T. A. Clarke, 1941, 77: 135.
 The Treatment of Varicose Veins in the Serving Soldier, B. McN. Truscott, 1941, 77: 159.

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The Psychological Aspects of Deafness, H. Frey, 1941, 56: 106.

THE MILITARY SURGEON

Investigations Concerned with Problems of High Altitude Flying and Deep Diving, A. R. Behuke, 1942, 90: 9.
 The Psychoneuroses as They Pertain to the Military Service, F. P. Pignataro, 1942, 90: 29.
 A Portable Orthopaedic Table, I. S. Egbert, 1942, 90: 72.
 The Problem of Allergy in Wartime, W. T. Vaughan, 1941, 89: 737.
 Problems of Military Surgery, G. C. Shivers, 1941, 89: 776.
 The Value of the Pseudo-Isochromatic Colour Vision Test in Original Applicants for Military Flying, M. S. White, 1941, 89: 801.

CANADIAN MEDICAL ASSOCIATION JOURNAL

The Mechanism of Cross Infection of Wounds in Hospital by Haemolytic Streptococci, R. E. Willitts and S. Hare, 1941, **45**: 479.

Chemotherapy of Meningococcal Meningitis, H. Little, 1941, **45**: 509.

The Efficiency of Industrial Workers (Editorial), A. G. Nicholls, 1941, **45**: 548.

Problems of Army Hygiene, M. R. Elliott, 1941, **45**: 517.

The Intracranial Use of Sulfadiazine, E. F. Hurteau, 1942, **46**: 15.

The Bacteriology of Recently Inflicted Wounds with Special Reference to the Haemolytic Streptococci and Staphylococci, R. Hare and R. E. Willitts, 1942, **46**: 23.

Canada's Supply of Army Doctors, W. J. Deadman, 1942, **46**: 60.

THE JOURNAL OF AVIATION MEDICINE

A Consideration of the Effects of Oxygen Lack on the Cardiovascular System, A. Graybiel, 1941, **12**: 183.

The Use of the Tilt-Table Test in Aviation Medicine, A. Graybiel and R. A. MacFarland, 1941, **12**: 194.

The Medical Aspects of Air Raid Casualties, C. L. Maxwell, 1941, **12**: 212.

Differences in Judgment of Depth Perception Between Stationary and Moving Objects, R. Y. Walker, 1941, **12**: 218.

Intelligence Testing of Flying Cadet Applicants, W. A. Carlson, 1941, **12**: 226.

CANADIAN PUBLIC HEALTH JOURNAL

The New Immunization Problem, in the R.C.A.F., A. H. Sellers, 1941, **32**: 509.

BOOKS AND PAMPHLETS

Evacuated Children (Edited by Susan Isaacs), Methuen & Co., London, 1941, Price 8/6 net.

Medical Diseases of War, Sir Arthur Hurst, Edward Arnold & Co., London; Macmillan Co., Toronto, Price \$5.50.

Lectures on War Neuroses, T. A. Ross, Macmillan, Toronto, 1941, Price \$1.75.

Wartime Health and Democracy, H. Clegg, J. M. Dent & Son, London, Price 1s.

Military Neurosurgery, W. A. Penfield, Government Distribution Office, Government Printing Bureau, Ottawa, Price 50 cents.

University Notes

McGILL UNIVERSITY

Dr. J. C. Meakins, Dean of the Medical School of McGill University has been appointed Acting Principal of the University during the absence in Britain of Principal James, who has left to consult with the Committee on Rehabilitation after the War.

Medical Societies

The Canadian Physiological Society

The seventh annual meeting of the Canadian Physiological Society was held at the Seigniory Club, Montebello, Quebec, on October 24 and 25, 1941. The total registration, members and guests, was 101.

The Council for 1941-42 was elected as follows: *President*—Professor V. E. Henderson, University of Toronto; *Secretary*—Professor R. G. Sinclair, Queen's University; *Treasurer*—Professor E. M. Watson, University of Western Ontario; *Councillors*—Professors G. Gosselin, Université de Montréal; E. W. McHenry, University of Toronto; M. K. McPhail, Dalhousie University; V. H. K. Moorhouse, Medical College, Winnipeg; D. L. Thomson, McGill University; and Dr. C. A. Morrell, Department of Pensions and National Health, Ottawa.

Thirteen new members were elected, making a total membership of two hundred and fifty-six.

Thirty-five papers were read during the two day session.

ON THE GONAD-PROTECTING EFFECT OF VARIOUS STEROID COMPOUNDS.—S. Albert and H. Selye, from the Department of Anatomy, McGill University, Montreal.

It has previously been shown that testosterone propionate and progesterone inhibit testis atrophy in hypophysectomized or oestrin treated rats and also in rats exposed to various non-specific damaging agents (Selye, Hans and Sydney Friedman, *Endocrinology*, 1941, **28**: 129). In continuation of this work it could be shown that Δ^5 -pregnene-3 (β) -ol-20-one and pregnane-3,20-dione (two steroids not normally found in living tissue) likewise prevent the testicular atrophy otherwise caused by hypophysectomy or oestrin administration. The atrophy of the accessory sex organs (seminal vesicles, prostates, preputial glands) which ensues as a consequence of the testis atrophy in hypophysectomized or oestrin-treated rats, is likewise prevented by the above mentioned two synthetic steroids. Since these compounds exert no distinct stimulating effect on the accessory sex organs of castrated males, their action in the present experimental series is considered to be mediated by the testis. Although these artificial steroids inhibit the atrophy of the mature testis, they are unable to induce precocious maturation of the immature male gonad. Hence they must be regarded as gonad protecting, but not gonadotropic in the ordinary sense of the word.

ON THE PROTECTIVE ACTION OF TESTOSTERONE AGAINST THE KIDNEY-DAMAGING EFFECT OF PHLORHIZIN.—H. Winter and L. F. Belanger (introduced by H. Selye), from the department of Anatomy, McGill University, Montreal.

Experiments in the rat indicate that phlorhizin glycosuria is greatly inhibited by testosterone pretreatment.

The loss of nitrogen through the urine, which is another usual consequence of phlorhizin intoxication, is less markedly inhibited. Indeed, taking into consideration that normally testosterone decreases nitrogen elimination—so that the initial base level before phlorhizin administration is lowered—it appears that the hormone has practically no effect on this action of phlorhizin.

The epithelial cells lining the convoluted tubules of the kidney are greatly enlarged as a result of testosterone pretreatment and appear resistant towards the damaging

action of phlorhizin as judged by the fact that marked degenerative changes are elicited by this drug in the control, but almost none in the testosterone pretreated kidney.

We regard these experiments as further proof that the renotropic action of testosterone is not merely a morphological effect, but goes hand in hand with an increase in the functional efficiency of the kidney epithelium.

ANÆSTHETICS AND SHOCK.—G. H. W. Lucas and (by invitation) C. S. Dafoe, Department of Pharmacology, University of Toronto.

An impression arose in 1919 that nitrous oxide was a better anaesthetic for shocked patients than ether. An experimental attempt was made to ascertain whether this idea was justified. Owing to the necessity of treating the material statistically, rabbits were used, temporarily anaesthetized with pentothal, bled and the intestines stripped during this anaesthesia, allowed to recover and then anaesthetized with nitrous oxide, ether or cyclopropane. A statistical analysis revealed that ether produced a significant increase in mortality which the two other anaesthetics did not.

DEPRESSOR SUBSTANCE(S) IN RELATION TO SHOCK IN RATS.—A. H. Neufeld, R. L. Noble and J. B. Collip, from the Research Institute of Endocrinology, McGill University, Montreal.

A modification of the method of Best and McHenry for the preparation of tissue extracts for the determination of depressor substance(s) is described. These were determined by the blood pressure method in the cat under nembutal. After adrenalectomy the rate of disappearance of intravenously administered histamine from the whole rat was much lower compared to normal animals, especially that of the gastro-intestinal tract. Normal and adrenalectomized animals, after being subjected to severe trauma, showed no appreciable changes of total body depressor substance(s), nor in its distribution between the gastro-intestinal tract and the carcass. The results do not favour the theory of the release of histamine after trauma in rats.

CHANGES IN BLOOD DURING STORAGE.—O. F. Denstedt, Department of Biochemistry, McGill University, Montreal.

One of the earliest changes detectable in stored blood is the loss of the normal impermeability of the red-cell membrane to cations. The consequent diffusion of potassium from, and sodium into, the corpuscles disturbs the osmotic balance between cells and plasma and brings about a redistribution of other electrolytes and of water. The process never reaches an equilibrium owing to progressive autolytic changes which liberate new osmotic particles, for example, lactate from glucose, and phosphate from pyrophosphate compounds, and also due to haemolysis. Haemolysis during storage of blood is brought about chiefly by the gradual swelling and ultimate bursting of the corpuscles due to the shift of water. The distribution of chloride between cells and plasma has been found to remain surprisingly steady during storage, and appears to be changed only by variation in the degree of oxygenation of haemoglobin. Haemoglobin itself is relatively stable, and undergoes no considerable deterioration within the storage period at present feasible for preservation of the red cells.

BUFFERED SEA WATER AS A PHYSIOLOGICAL LIQUID.—J. L. Tremblay and (by invitation) G. W. Corriveau, Department of Biology, Laval University, Quebec.

Sea water buffered at pH 7.3 with sodium lactate, and so diluted as to become isotonic to blood serum, was tested on tissue cultures as well as on laboratory animals. The behaviour of tissues cultured in such a medium seems

quite improved; laboratory animals injected with large quantities of the liquid did not show any intolerance symptoms.

In addition to its property of counterbalancing alklosis or acidosis like Hartman's serum, this liquid may be considered as isotonic to blood.

THE PHARMACOLOGY OF THE INFLATION AND DEFLATION RESPIRATORY REFLEXES.—Velyien E. Henderson and (by invitation) C. L. Yi, Department of Pharmacology, University of Toronto.

The method employed by Ferguson in this laboratory for studying these reflexes was elaborated and will be described. The effect of administering morphine, barbiturates, nikethamide, metrazol, picrotoxin, cocaine and caffeine were studied. Roughly the results may be summarized by saying that drugs which decreased the respiratory rate increased the reflexes, while those which increased the rate decreased them.

THE EFFECTS OF BIOTIN UPON FAT SYNTHESIS AND METABOLISM.—Gertrude Gavin and E. W. McHenry, School of Hygiene, University of Toronto.

Previous work has shown that the administration to rats of an alcohol soluble fraction of beef liver causes markedly fatty livers characterized by a high content of cholesterol. Impure solutions of biotin from several sources and pure biotin given to rats in conjunction with thiamin, riboflavin, pyridoxine and pantothenic acid cause fatty livers similar to those produced by the alcohol soluble fraction of beef liver. The effect of biotin is prevented by simultaneously feeding egg white, lipoic acid, or inositol. It is concluded that the beef liver fraction owes its activity to its content of biotin. Biotin has an additive effect upon body fat and body weight.

List of other papers read but not abstracted here.

A MANOMETRIC MICROMETHOD FOR DETERMINATION OF CARBONATE IN SOLIDS.—J. F. McIntosh, Department of Medicine, McGill University Clinic, Royal Victoria Hospital, Montreal.

METABOLIC CHANGES IN NOVA SCOTIA OYSTERS STORED AT LOW TEMPERATURE.—By Eldon M. Boyd, Eleanor L. Clarke, Mary Baker (by invitation) and Alice Ronan (by invitation), Department of Pharmacology, Queen's University, Kingston.

THE ACTION OF PHENOTHIAZINE AS AN ANTHELMINTIC.—H. B. Collier, Institute of Parasitology, Macdonald College, Quebec.

PHOSPHOLIPID CONTENT OF RAT LIVER AND KIDNEY.—Jean M. Patterson (by invitation) and E. W. McHenry, School of Hygiene, University of Toronto.

THE SO-CALLED ETHER-INSOLUBLE PHOSPHOLIPIDS IN BLOOD AND TISSUES.—R. G. Sinclair and Margery Dolan, Department of Biochemistry, Queen's University, Kingston.

SOME PHARMACOLOGICAL ACTIONS OF FLAVONES AND A RELATED SUBSTANCE.—H. Ward Smith (by invitation) and Russell A. Waud, Department of Pharmacology, University of Western Ontario, London.

INCREASED IODINE FIXATION BY THE THYROIDS OF RATS GIVEN A DIET PARTIALLY DEFICIENT IN IODINE.—C. P. Leblond and W. Mann (introduced by H. Selye), from the Department of Anatomy, McGill University, Montreal, and the Departments of Radiology and Anatomy, University of Rochester, Rochester, New York.

THE PRIMARY ACTION OF THE PARATHYROID HORMONE.—A. H. Neufeld and J. B. Collip, from the Research Institute of Endocrinology, McGill University, Montreal.

STUNTING OF CHICKS BY TESTOSTERONE.—G. H. Ettinger, Department of Physiology, Queen's University, Kingston.

THE INFLUENCE OF CALCIUM AND PHOSPHORUS LEVELS AND RATION COMPOSITION ON THE REACTION OF CHICKS TO VITAMIN D.—B. B. Migicovsky (by invitation) and A. R. G. Emslie, Division of Chemistry, Science Service, Department of Agriculture, Ottawa.

ASSAY OF VITAMIN B₁: A SHORT BIOLOGICAL METHOD.—W. A. Crandall (introduced by C. A. Morrell), Laboratory of Hygiene, Department Pensions and National Health, Ottawa.

THE SOURCE OF CALCIUM IN GASTRIC SECRETIONS AND ACIDITY REGULATION BY GASTRIC MUCUS.—Rhoda Grant, Department of Physiology, McGill University, Montreal.

SOME EFFECTS OF THE HÆMORRHAGIC FACTOR.—John K. Souch, Victor Schenker and Thomas Holmes (introduced by G. A. Grant), Research and Biological Laboratories, Ayerst, McKenna and Harrison Ltd., Montreal.

AUGMENTATION OF CORTICOTROPHIC ACTIVITY BY PITUITARY EXTRACTS AND THE EFFECT ON THE ADRENAL AND PREPUTIAL GLANDS OF THE RAT.—R. L. Noble and J. B. Collip, from the Research Institute of Endocrinology, McGill University, Montreal.

ACTION OF POSTERIOR PITUITARY EXTRACT ON THE DOG HEART.—G. H. Ettinger and Margaret E. M. Sawyer, Department of Physiology, Queen's University, Kingston.

THE ANTAGONISM BETWEEN STEROID ANÆSTHESIA AND PICROTOXIN.—Eleanor L. Clarke, from the Department of Anatomy, McGill University, Montreal.

VARIABLES AFFECTING THE ACCURACY OF THE BIOLOGICAL ASSAY OF OESTRONE.—L. I. Pugsley, Laboratory of Hygiene, Department of Pensions and National Health, Ottawa.

THE OXIDATION OF α -ESTRADIOL TO OESTRONE IN MAN.—R. D. H. Heard and M. M. Hoffman (by invitation), Department of Biochemistry, Dalhousie University, Halifax.

OESTROGEN METABOLISM IN THE RABBIT.—W. S. BAULD (by invitation) and R. D. H. Heard, Department of Biochemistry, Dalhousie University, Halifax.

THE RÔLE OF PROGESTERONE AND LOCAL TRAUMA IN THE PRODUCTION OF CYSTIC-GLANDULAR CHANGES IN THE ENDOMETRIUM AND HYPERTROPHY OF THE MYOMETRIUM.—Georges Masson, from the Department of Anatomy, McGill University, Montreal.

THE PRODUCTION OF MAMMARY TUMOURS IN THE RAT FOLLOWING THE ORAL ADMINISTRATION OF DIETHYLSTILBŒSTROL OVER PROLONGED PERIODS.—R. L. Noble and J. B. Collip, from the Research Institute of Endocrinology, McGill University, Montreal.

BIOLOGICAL ACTIVITY OF SOME NEW WATER-SOLUBLE DERIVATIVES OF DIETHYL STILBŒSTROL AND DIETHYL DIHYDRO STILBŒSTROL.—Gordon A. Grant, John K. Souch (by invitation) and (by invitation) Charles M. Hayes, Research and Biological Laboratories, Ayerst, McKenna and Harrison, Ltd., Montreal.

THE SEX HORMONE ACTIONS OF SOME STEROIDS RELATED TO DESOXYCORTICOSTERONE AND PROGESTERONE.—A. Borduas (introduced by H. Selye), from the Department of Anatomy, McGill University, Montreal.

THE CONVERSION OF PROGESTERONE TO PREGNANEDIOL IN THE RABBIT.—R. D. H. Heard and M. M. Hoffman (by invitation), Department of Biochemistry, Dalhousie University, Halifax.

THE ISOLATION OF A WATER SOLUBLE CONJUGATED OESTROGEN FROM THE URINE OF α -ESTRADIOL TREATED RABBITS.—W. S. Bauld (by invitation), R. D. H. Heard and M. M. Hoffman (by invitation), Department of Biochemistry, Dalhousie University, Halifax.

THE INFLUENCE OF THE ADRENAL FACTOR ON MORTALITY FOLLOWING GRADED DEGREES OF TRAUMA (WITHOUT HÆMORRHAGE OR ANÆSTHESIA) IN THE RAT.—R. L. Noble and J. B. Collip, from the Research Institute of Endocrinology, McGill University, Montreal.

CHANGES IN CARBOHYDRATE METABOLISM DURING SHOCK.—C. Dosne, from the Department of Anatomy, McGill University, Montreal.

Montreal Physiological Society

The monthly meeting of the Society was held on December 15, 1941. The scientific program was as follows.

FURTHER STUDIES ON THE METABOLISM OF PROGESTERONE.—M. M. Hoffmann (introduced by J. S. L. Browne), University Clinic, Royal Victoria Hospital.

MICTURITION AND VOMITING AS BEHAVIOURAL DISTURBANCES.—S. Dworkin, Department of Physiology, McGill University.

THE EFFECT OF THE ADMINISTRATION ON THE MORPHOLOGICAL ACTION OF PROGESTERONE.—Helen A. Winter (introduced by H. Selye) Department of Anatomy, McGill University.

ABSTRACT

Experiments in the albino rat indicated that although the intraperitoneal administration of progesterone, which led to a rapid absorption of the hormone, was more effective in producing anaesthesia than the subcutaneous, the reverse was true of the morphological actions. Subcutaneous injection of this hormone was more effective with regard to its ability to cause atrophy of the adrenal cortex, thymus and ovaries, and hypertrophy of the uterus. Also the mammotropic effect was almost absent when the hormone was given intraperitoneally. The thymus atrophy, the uterine hypertrophy and the diuresis caused by progesterone were much more pronounced in the hypophysectomized animal.

Experiments in rats and mice indicated the hypochloræmic response, the kidney-enlargement and adrenal involution produced by desoxycorticosterone acetate occurred only to a slight extent or not at all after the intraperitoneal administration of the hormone.

La Société médicale des hôpitaux universitaires de Québec

Une séance de cette Société, eut lieu à la Clinique Roy-Rousseau le 14 novembre, 1941. Suivent les résumés des présentations.

SYNDROME D'HYPEROSTOSE FRONTALE INTERNE À CARACTÈRE FAMILIAL "METABOLIC CRANIO-PATHY".—M. Samson, S. Caron et C. A. Martin.

Le but de la présente communication est de montrer que cette affection peut revêtir un caractère familial. Quatre membres d'une même famille, la mère et trois de ses enfants, présentent de l'hyperostose frontale interne. La mère et l'un des fils présentent une symptomatologie typique, à savoir: une hyperostose frontale et des symptômes physiques et neuro-psychiatiques: obésité, céphalée frontale, ralentissement moteur et psychique, troubles de la vue, etc., etc.; deux autres enfants tout en présentant de l'hyperostose ont une symptomatologie plutôt fruste.

ÉPILEPSIE BRAVAIS-JACKSONNIEN, SYMPTÔMATIQUE D'UNE TUMEUR CÉRÉBRALE CHEZ UN JEUNE HOMME DE 22 ANS AYANT SOUFFERT D'UNE COMMOTION CÉRÉBRALE.—S. Caron et M. Samson.

Un jeune homme de 22 ans est victime d'un accident d'auto—traumatisme crânien—perte de conscience durant quelques minutes, puis psychose émotionnelle de quelques semaines. Après la guérison de celle-ci il se plaint de malaises post-commotionnels. Quelques mois plus tard apparaissent des crises d'épilepsie du type Bravais-Jacksonien droit avec dysarthrie. Admis trois mois plus tard à la Clinique Roy-Rousseau, il meurt 18 heures après un répérage ventriculaire. L'examen n'avait révélé aucune fracture du crâne, pas de syphilis, aucune modification du liquide céphalo-rachidien et dans sa tension et dans sa composition. L'autopsie a révélé l'existence d'un glioblastome siégeant dans l'hémisphère gauche. Elle s'étend de la partie supérieure du centre ovale à la base des noyaux gris; en largeur elle détruit la plus grande partie du noyau lenticulaire, la partie postérieure du bras postérieur de la capsule interne, latéralement, elle envahit les circonvolutions de l'insula et en arrière, elle fait hernie dans le ventricule latéral, dilaté.

CONCLUSIONS

1°—L'accident d'auto n'était nullement responsable de ce type d'épilepsie. 2°—Les tumeurs cérébrales ne s'accompagnent pas toujours d'hypertension intracrânienne, ni de dissociation albumino-cytologique. 3°—L'épilepsie du type Bravais-Jacksonien n'indique pas toujours les lésions corticales ou sous-corticales. 4°—Le danger de faire des ponctions lombaires à domicile chez des malades pouvant souffrir de tumeur cérébrale.

QUELQUES ASPECTS MÉDICAUX DE LA CRIMINALITÉ.

—G. Desrochers.

Dans l'état actuel de notre législation, l'examen psychiatrique des criminels n'est guère demandé que dans les cas où l'aliénation mentale est évidente pour tous et l'expertise porte avant tout sur la question de la responsabilité des aliénés.

L'écart entre le point de vue légal et le point de vue médical sur cette question ne peut être comblé à moins d'une réforme de la loi qui tiendrait compte des progrès accomplis par les sciences psychiatriques.

Mais le rôle du psychiatre ne devrait pas être limité à l'examen des aliénés criminels. L'étude des psychopathes criminels et l'analyse psychologique des criminels apparemment normaux met en valeur l'importance des facteurs psychopathiques dans la genèse du crime. Elle peut conduire à une application plus efficace des mesures d'ordre médical et social destinées à réhabiliter le criminel et à prévenir les récidives.

Une collaboration étroite entre médecins, juristes et sociologues permettrait d'obtenir de meilleurs résultats dans la réforme des criminels, tout en ne courant pas le risque d'affaiblir inutilement la défense de la société.

MÉTRAZOL ET ÉPILEPSIE.—G. H. Larue, A. Pelletier et C. A. Martin.

L'emploi du métrazol chez l'épileptique est du domaine diagnostique plutôt que thérapeutique. Chez un sujet apte aux convulsions, une injection intra-veineuse de ce médicament à dose inférieure à 3 cc et répétée si nécessaire à une journée d'intervalle, déclanchera une crise convulsive. Les résultats de cette épreuve nous paraissent supérieurs au test de l'hyperpnée et à celui de la rétention des liquides.

Au point de vue thérapeutique nous n'avons pu confirmer les résultats favorables de certains auteurs chez 10 épileptiques traités par le métrazol. La méthode de Kalinowsky consistant à libérer un épileptique de son accès à venir, par l'électrochoc, paraît plus prometteuse.

La Société médicale de Montréal rapport annuel du secrétaire général pour l'année 1941* (en partie)

Il est d'usage que le secrétaire de la Société Médicale, lors de la dernière séance de décembre, résume les activités de l'année, dans un rapport, qu'il présente au nom de l'Exécutif.

C'est avec plaisir que je me conforme à une aussi louable tradition.

On a souvent dit et répété que les années se suivent et ne se ressemblent pas. En 1941, la Société Médicale a continué sa marche ascendante dans la voie du progrès. Elle a continué à tenir, comme par le passé, des réunions le 1er et le 3ème mardi de chaque mois et à mettre à l'ordre du jour les grandes questions de l'actualité scientifique. Mais elle a fait la part des événements; elle s'est préoccupée des besoins de l'heure, qui sont urgents et impérieux; elle a réalisé pleinement que nous sommes en guerre contre de redoutables puissances et que la profession médicale aura bientôt la responsabilité de soigner les blessés et de protéger la population civile.

* Rapport présenté, lors de la dernière séance de l'année 1941, le 16 décembre, à l'Hôtel-Dieu, sous la présidence de M. Hector Sanche. Ce rapport, qui fut adopté à l'unanimité, ne comprend pas le programme des "Journées Médicales", qu'on trouvera dans *L'Union Médicale du Canada* (Nos. de novembre et décembre 1941).

C'est ainsi que les grands syndromes hémorragiques et les hémorragies méninées d'une part, la grippe et la fièvre typhoïde d'autre part, firent l'objet d'études spéciales; c'est ainsi que tout récemment la Société recevait le contre-amiral Gordon-Taylor, chirurgien-en-chef de la marine royale, qui nous parla *en français* du traitement des plaies de guerre.

Les autres séances académiques portèrent sur des sujets d'ordre pratique ou social, comme le problème amygdalien, l'opothérapie en gynécologie, la diphtérie, le cancer.

Tout en accordant à ces symposiums l'importance qu'il convient, nous n'avons pas négligé les séances cliniques dans les hôpitaux, où le praticien peut se rendre compte par lui-même de l'application des nouveaux procédés de diagnostic et de traitement. Toutefois, nous aimerions qu'il y ait davantage un contraste entre les séances académiques et les réunions hospitalières. Nous voudrions que les séances cliniques soient uniquement constituées par des présentations de malades ou des démonstrations pratiques, de manière à ce que le médecin ne perde pas l'habitude de l'observation du malade, art dans lequel ont toujours excellé les maîtres de l'Ecole française, dont nous sommes ici les représentants sur cette terre d'Amérique.

L'an dernier, la Société Médicale de Montréal, à l'occasion de son quarantième anniversaire, inaugurerait des "Journées Médicales", qui connurent un éclatant succès.

De semblables assises furent répétées cette année les 1er, 2, 3 et 4 octobre et coïncidèrent avec le banquet annuel de la Société, lequel eut lieu le 3 octobre, au Cercle Universitaire, sous la présidence d'honneur de l'honorable Henri Groulx, ministre de la Santé et du Bien-Etre Social.

Le nombre de nos membres en 1941 a sensiblement augmenté, puisqu'il dépasse maintenant 500.

Nous avons eu à déplorer, au cours de l'année, la perte des Drs Edgar Langlois, Médéric Le Moigne, J.-M.-A. Valois et A.-H. Desloges, depuis longtemps membres de notre Société.

PAUL LETONDAL,
General Secretary.

Winnipeg Medical Society

A special meeting of this Society was held on December 12th in the Medical College to receive a report from the Committee on Economics of the Manitoba Medical Association which had been considered by the Executive Committee of that body and recommended for submission to the profession. Dr. H. D. Kitchen, President of the Manitoba Division of the Canadian Medical Association was in the chair.

Dr. Gordon S. Fahrni, President of the Canadian Medical Association outlined briefly the

present status of the Federal Health Insurance Bill.

Dr. E. S. Moorhead, Chairman of the Manitoba Committee on Economics, presented the report of the Committee. The schemes proposed were as follows: Combined Medical Prepaid Services Basic rate for those with an income of \$2,500 per annum or less.

SERVICE A

Surgical Service in hospital only. (Definition, operative and cutting procedures in the treatment of diseases and injuries: treatment of fractures and dislocations). X-ray to the value of \$15.00 if ordered by doctor. Maternity services in hospital after one year's continuous membership. Charges: \$0.50 a month for husband or employee; \$1.25 a month for man and wife; \$2.00 a month for man, wife and unemployed children under 19 years.

SERVICE B

A complete medical and surgical service as provided in the Winnipeg Firefighters' Medical Scheme with the same restrictions. Charges: \$1.50 a month for husband or employee; \$1.30 a month for wife or adult dependant; \$0.80 a month for unemployed dependants under 19 years.

The Committee recommended that in the event of the profession approving these schemes, there should be a close tie-in with the Manitoba Hospital Service Association, leaving to that body the task of enrolling subscribers to the medical schemes.

It was also recommended that subscribers with a yearly income exceeding \$2,500 would receive surgical and medical benefits to the extent set forth in Services A and B. If the doctor in attendance thought a higher charge could reasonably be paid, he would be entitled to bill the patient for the difference between the benefits and the fee charged.

Mr. Philip Dawson, Associate Director of the Manitoba Hospital Service Association, addressed the meeting by invitation. He spoke of the many requests for provision of medical care on an insurance basis which had come from various groups in the community. Following this there was a full discussion which lasted till midnight. Finally a resolution was passed approving of Service B, and approving in principle of Service A, though the clauses relating to x-ray and maternity services had rather a rough reception. Subsequent amendments may be necessary.

The Winnipeg Firefighters Scheme has been in operation for over fifteen months and at the last report had 560 members enrolled. According to Mr. Arthur Young, secretary of the Firefighters Club, those enrolled are very satisfied with the medical service.

Mr. Philip Dawson is reported to have stated that he expected 80 per cent of the 55,000 members of the Manitoba Hospital Service Association would subscribe to the new plan.

ROSS MITCHELL

Special Correspondence

The London Letter

(From our correspondent)

Children and the war.—At the beginning of the war the evacuation of large masses of children from the big cities brought up several unexpected problems. On the physical side "beds and heads" rather dominated the picture, and country dwellers were somewhat perturbed at the amount of enuresis among town children and at the amount of urban pediculosis. After a longer period and after last autumn's air raid experiences the centre of interest has shifted to the psychological side. One psychologist sums the matter up aptly with the phrase "death has become a personal problem and parental authority is no longer a safe shield against the direct threat of extinction". It is found that previously good and intelligent children become suddenly obstreperous, destructive, mischievous, lazy, truant from school and, in short, unmanageable in the billet to which they have been evacuated. A noticeable feature has been a strange inability to occupy themselves in their free time. One worker reports that the prognosis is uniformly good provided that the children are removed from the billet to a residential school.

Curiously different results were found when children from different bombed areas were questioned. Most of the evacuees from Plymouth and Bristol want to return home but London children have almost to be fetched home by force! A special study in Bristol of juvenile delinquency in that city showed an increase of nearly 50 per cent in the numbers of cases referred from the juvenile courts to the child guidance clinic, mainly accounted for by the group of "very dull" children who are receiving less supervision in the home than in peace-time. Such children, it is agreed, would be better in residential schools or farm institutes.

A special study in Manchester brought to light the interesting fact that, whatever the ultimate outcome, the immediate effect of evacuation, which means separation from parents and a known and accepted environment, is worse than the immediate effects of air raids. Children of this city who have been evacuated are more disturbed by the talk of raids or the sound of distant sirens than by the reality of bombing. Meanwhile some pre-existing theories have received rude shocks. We had been led to believe by many a child psychologist that residential nursery schools provided a perfect environment as compared with the average home with its amateur efforts at bringing up children. But now after two years of experience many a worker in such schools is witnessing an outbreak of all the old tricks—thumb-sucking, temper tantrums and so forth—and this it is felt is due to the lack

of personal love and attention. So the aunt and granny are likely to come into their own again as better in the long run for children away from their own parents than even the most perfect nursery school.

Psychiatry and the war.—This war like previous wars has not brought about any increase in this country in the incidence of psychosis and neurosis. But a considerable proportion of the number of beds required at the beginning of the war by the Emergency Medical Service were provided by the mental hospitals and most of the big mental institutions have given up a quarter of their beds. Shortage of nurses and medical staff, some degree of over-crowding and darkening of wards by blast walls and blackout curtains have all impaired pre-war standards and led to some difficulties. Nevertheless applications for admission, even on a voluntary basis, are being coped with and in the London area not a single application has been refused. At Guy's Hospital, with devastation all around, a fine new building has been completed, known as the York Clinic, which will come into use after the war as a psychiatric clinic as part of a general teaching hospital. More than 200 years ago Thomas Guy provided in his will for the care of 40 chronically insane patients in a ward which should stand in the hospital precincts, but the governors of that day secured the transfer of the funds and the responsibility to the Bethlem Hospital for mental cases.

The pioneer effort in London took place at the Middlesex Hospital about 20 years ago when certain beds were set aside in a general teaching hospital for border-line mental cases, mostly of psychoneurosis or early psychosis, but Guy's has outstripped this with a complete unit of 42 beds, mostly in single rooms, and with lounges and public rooms. Thus after the war patients with early mental disorder can secure admission with no more formality than attends the admission of other types of case to a general hospital and students will have ample opportunity of clinical teaching in this subject as part of their every-day curriculum.

Health campaign.—Problems of shelter life have led to a great increase in valuable propaganda on how to keep healthy. It is good news that the Ministry of Health in collaboration with the Central Council for Health Education has launched a great campaign to secure the co-operation of the public in reducing the spread of diseases caused by droplet infection. Showcards and posters will be exhibited in buses, trams and underground trains, at main railway stations, and in chain stores and the vestibules of cinemas until next March. They are also to be displayed in factories with the co-operation of the Ministry of Labour. Already a three-week display of posters in 1,500 stores and gas and electricity undertakings throughout the country has been

carried out, and it is announced that films are available on the dangers of unguarded coughing and sneezing. Thus at long last the "cure" of the common cold has been tackled at its source, so to speak, with sound advice on its prevention. In normal times it is reckoned that this malady and "influenza" are responsible for 40 per cent of the working hours lost in industry. So that not only will better health mean more munitions but the educational campaign should serve to awaken a health conscience in the whole nation.

ALAN MONCRIEFF.

London, December, 1941.

Abstracts from Current Literature

Medicine

Effective Renal Blood Flow in the Separate Kidneys of Subjects with Essential Hypertension. Chasis, H. and Redish, J.: *J. Clin. Invest.*, 1941, **20**: 655.

The clearance method was applied to the measurement of the renal blood flow, the filtration rate, and the tubular excretory mass in the separate kidneys of patients with essential hypertension. The results of these observations indicate that the destruction of tubular tissue progresses equally on the two sides in hypertensive disease, and that the functional disturbance in respect to blood flow and filtration rate is shared equally by the two kidneys.

In no instance in the 21 hypertensive subjects picked at random was there any indication of unilateral ischaemic kidney. If it is predicated that renal ischaemia is the primary causal factor in all essential hypertension, it would be expected that unilateral impairment of renal function would be observed more frequently than bilateral impairment.

The absence of unilateral impairment argues against this premise.

S. R. TOWNSEND

Recent Advances in Gastro-enterology. Douthwaite, A. H.: *The Practitioner*, 1941, **147**: 880.

During the past two years considerable interest has been aroused in the subject of digestive disorders affecting members of the Forces. Of 287 cases reported upon by Payne and Newman some 226 proved to have peptic ulcer. A most important part in their summary was that 92 per cent of ulcers were present before the war. The most important lesson to be learned from the inquiry is that no person who has suffered from peptic ulceration should be subjected to the strain and the irregular life of the Army. Nearly all of the ulcer cases had lived for years on a comparatively strict diet, and the breakdown appeared to be due to the change to Army food which is

too heavy for those prone to ulcer. The cooking of the food was much criticized, it being declared too heavy and fatty for dyspeptics to deal with. Soldiers with ulcers, in an attempt to diet themselves, avoided green food and thus suffered from a shortage of vitamin C. It is concluded that the problem of dyspepsia in the Army is more or less the same as that of peace-time civil life, any difference being determined by such factors as age groups, sex, or general anxiety about the war. The main causal factors are considered to be the unsuitable Army food together with the lack of facilities for frequent feedings and the enormous increase in tobacco smoking which has brought about a relapse from its restriction amongst those suffering from dyspepsia.

Treatment of gastric and duodenal ulcers shows no great advance but rather a simplification. Aluminum hydroxide gel and magnesium trisilicate still vie for pride of place as antacids. Work by Smith has fully justified the use of olive oil as an acid-depressant given before meals.

All are agreed that haemorrhage of moderate severity should be treated medically. The following steps should be carried out: (1) An injection of papavertum 1/3 grain and hyoscyamine sulphate 1/80 grain should be preferred to morphine as it is less likely to cause vomiting and pyloric spasm. (2) Dietary regimen consisting of 8 feedings a day together with sips of water, glucose solution and isotonic saline solution in half strength up to 5 ounces between feeds. More food should be given at night if awake. (3) Blood transfusion should be given if the haemoglobin is below 40 per cent, the blood pressure below 90 mm., the blood urea above 100 mg. per 100 c.c., or the pulse rate above 140. (4) In cases of chronic ulcer with brisk haemorrhage on top of a chronic leak the iron stores of the body should be supplemented. (5) No purge for 5 days. No enema for 3 days.

If the haemoglobin continues to fall in spite of medical treatment, including adequate transfusion, then it is clear that bleeding is unchecked and operation should be performed.

C. R. BOURNE

The Cervico-brachial Syndrome. Hansson, K. G.: *Arch. Physical Therapy*, 1941, **22**: 662.

This paper is a discussion of the conservative treatment of cervical rib and the scalenus anterior syndrome. Of these cases 15 per cent come to operation while the other 85 per cent are conservatively treated. This syndrome may be the result of (1) high first ribs, (2) cervical ribs, (3) scalenus pressure, (4) pneumothorax, (5) poor posture with increased upper extremity traction. The common cause in all cases is lowering of the tone of the muscles supporting the scapular weight. The irritation, traction, and pressure on the cervical

nerves and subclavian vessels explain the cervico-brachial syndrome. The symptoms are, neuritic pains in the neck, shoulder and down the arm to the hand, vascular complaints with diminished pulse or blood pressure, on the affected side and tenderness over the scalenus anterior or brachial plexus. The treatment is rest and support during the acute stage. Then exercises to teach holding the shoulder high, modified Buerger's exercises for the arm, exercises for the development of mobility of the shoulder girdle. General postural exercises are also helpful. Heat to relieve irritation. For the remaining 15 per cent of cases surgery is required.

GUY H. FISK

The Kayser Fleischer Ring Associated with Hepato-lenticular Degeneration. Gartner, S.: *Arch. Ophth.*, 1941, 26: 595.

The Kayser Fleischer ring around the edge of the cornea has been described before in those persons suffering from Wilson's disease or hepato-lenticular degeneration. Gartner reports three families in which this eye condition was found in association with the nervous disease involving the lenticular nucleus. In all three the parents were related as first cousins, suggesting that the disease is dependent upon inherited Mendelian recessive factors. In the first family, three sisters were affected, two of them twins; in the second family twin sisters were affected; and in the third only one child was affected.

MADGE THURLOW MACKLIN

Surgery

Acute Cholecystitis. Wallace, R. H. and Allen, A. W.: *Arch. Surg.*, 1941, 43: 762.

Acute cholecystitis was present in 415 patients, or 18.25 per cent of the 2,273 patients operated on for nonmalignant extrahepatic disease of the biliary tract, in the Massachusetts General Hospital, in a ten year period from January 1, 1930, exclusive of the Phillips House private ward. The operative mortality rate was 6.06 per cent. The authors were interested in determining if possible the factors influencing the mortality and the mortality in these cases of acute cholecystitis. Gangrene of the gallbladder often follows acute cholecystitis and rupture of the gallbladder frequently takes place under these circumstances, hence they have analyzed their cases in regard to these factors. That the operative mortality is higher in the presence of gangrene is established, notwithstanding the infrequency of generalized peritonitis accompanying this complication. In 29.4 per cent of their series of acute cholecystitis, gangrene of the gallbladder was present and in over half of these it had perforated. Their statistics show that operation for acute cholecystitis with or without gangrene is accompanied by a reasonably satisfactory mortality rate, unless perforation has taken place.

They attempted to find some indications by which gangrene and perforation could be predicted. They concluded that with conservative treatment even under careful observation in the hospital these complications cannot be anticipated, and frequently progress to a dangerous state. It is unusual for them to occur before the sixth day after the onset of symptoms. Operation within four days of the onset of symptoms is relatively safe if there has been proper preoperative preparation. Cholecystectomy is the procedure of choice. Also, early intervention would practically eliminate the hazard of gangrene with perforation in the patients coming to the hospital.

G. E. LEARMONT

How to Use Catgut. "De l'utilisation du catgut." Howes, E. L.: *Surg., Gyn. & Obst.*, 1941, 73: 319.

Le catgut est le matériel de suture le plus employé et pourtant celui sur lequel on a le moins écrit.

L'emploi du catgut simple ou chromé est déterminé selon le degré de résistance des tissus à réparer et les nécessités de leur cicatrisation. Si le catgut chromé est plus résistant, son absorption est plus lente. Le catgut simple est recommandé chaque fois qu'il s'agit d'une cicatrisation rapide ou de tissus scléreux.

En général, le catgut convient mal à la peau, au tissu adipeux sous-cutané, aux muqueuses et aux muscles.

La résistance maxima des points est une question de bonne technique chirurgicale: suture du fascia seul, à angle droit et par points séparés.

On évitera bien des complications en employant un catgut de grosseur décroissante, du No. 0 à 00000 selon les tissus, et en petite quantité. Le catgut, corps étranger susceptible d'introduire des microbes dans la plaie, voit ainsi son action contaminatrice minimisée, surtout si l'on a pris les précautions pré et co-opératoires d'usage pour éviter de créer un foyer d'infection dans la cavité péritonéale. On préviendra aussi l'éventration ou la hernie post-opératoire dans les laparatomies en suturant principalement le feuillet aponévrotique postérieur du muscle droit.

En définitive, le mode de réparation employé, quel qu'il soit, doit concourir à la régénérence des cellules après l'opération. En aucun cas, il ne doit y faire obstacle. C'est une question d'observation, de choix et de méthode.

PIERRE SMITH

Gastric Ulcers. Significance of Diagnosis and Its Relationship to Cancer. Allen, A. W. et Welch, C. E.: *Ann. Surg.*, 1941, 114: 498.

Dans ce travail très complet portant sur le diagnostic différentiel de l'ulcère gastrique et du cancer, les auteurs insistent sur les difficultés de ce diagnostic. Ils en viennent à la conclusion que l'ulcère gastrique est une lésion

chirurgicale, contrairement à l'ulcère duodénal. Dans un pourcentage élevé de cas, le diagnostic entre les deux, est pratiquement impossible à faire. Comme indice important de malignité, et par conséquent d'intervention chirurgicale, ils insistent sur les points suivants: 1°—Ulcère d'apparition récente chez un malade de plus de 50 ans. 2°—Ulcère dont la niche dépasse 2.5 cm. en diamètre. 3°—Absence d'acide chlorhydrique libre dans l'estomac. 4°—Ulcère siégeant sur la grande courbure ou sur la région prépylorique. 5°—Ulcère chronique (de longue durée) siégeant sur la petite courbure.

Ils recommandent le traitement médical et l'observation hospitalière au cours des éventualités suivantes: 1°—Ulcère en poussée aigue chez un jeune malade. 2°—Ulcère dont la niche est inférieure à 1 cm. de diamètre. 3°—Ulcère siégeant sur la petite courbure, sur la face antérieure et postérieure de l'estomac.

Si la cicatrisation est complète après un mois, ils recommandent un nouveau contrôle un mois ou deux après la sortie de l'hôpital. Si la cicatrisation et la guérison ne sont pas complètes au bout de deux mois de traitement, et ceci vérifié par la radiographie, et la gastroscopie, ils recommandent l'intervention chirurgicale.

Comme notes personnelles, il nous fait plaisir de constater que ces notions ont été depuis longtemps enseignées par le professeur René Gutmann, de Paris, dont les travaux sur le diagnostic précoce du cancer de l'estomac, se trouvent de jour en jour vérifiés.

YVES CHAPUT

Obstetrics and Gynaecology

Thrombosis in the Superior Longitudinal Sinus Following Childbirth. Martin, J. P.: *Brit. M. J.*, 1941, 2: 537.

Thrombosis in the superior longitudinal sinus occurs in the puerperium and after abortion. The clinical diagnosis depends upon signs of raised intracranial pressure and signs of obstruction of superior cerebral veins. Under certain conditions the diagnosis may be made in the presence of only one of these groups of signs.

Clinical accounts are given of three cases which are believed to be of this nature.

It is suggested that a fragment of clot carried up to the superior longitudinal sinus from the pelvic veins by way of the vertebral venous system acts as the nucleus for the clot which forms in the sinus.

Ross MITCHELL

Early Involvement of the Ovaries in Carcinoma of the Body of the Uterus. Barns, H. H. F.: *J. Obst. & Gyn. Brit. Emp.*, 1941, 48: 443.

This is a review of 95 cases of carcinoma of the body of the uterus. "Seven cases of ovarian involvement by secondary metastases in carcinoma of the body of the uterus are briefly discussed."

The incidence of ovarian metastasis in the small series of 95 cases of corporeal cancer was 7.4 per cent. The majority of the patients were in the age-group 50 to 59 years. The routes of spread from the uterus to the ovaries are briefly outlined. Four main routes are described: (1) by transtubal implantation; (2) by transplantation or direct extension; (3) by lymphatic extension; and (4) by infection of blood vessels.

It is suggested that involvement of the ovaries may occur early and that the prognosis, provided that there is no other extra-uterine extension, is good.

P. J. KEARNS

A Survey of the Results of Repair and Amputation of the Cervix. Solomons, E.: *J. Obst. & Gyn. Brit. Emp.*, 1941, 48: 461.

During 9 years, 302 patients were operated upon, and communication was made asking them to come for re-examination; of these only 104 attended. The operations were either Emmet's trachelorrhaphy, Schroeder's amputation or circular amputation. Ninety-four received much benefit from operation, backache being the commonest remaining symptom. Seventy had no discharge after operation. Three had a worse discharge after operation than before. The remainder were improved by operation in this respect.

Trachelorrhaphy gave the best results for fertility, 23 out of a possible 30 patients subsequently becoming pregnant.

Examination revealed that 72 cervices had completely healed; one was a bad result and the remainder showed various degrees of slight ectropion or erosion. No cases of carcinoma of the cervix have been encountered after amputation or repair.

In 115 cases of cervical amputation or repair performed during the past 2 years, 4 of the patients developed a secondary haemorrhage within 14 days of operation. In the same series sepsis of any kind was absent.

P. J. KEARNS

Oto-rhino-laryngology

Electrical Accidents: Shock, Burns and Glare Injuries to Eyes. Fisher, H. E.: *Arch. Physical Therapy*, 1941, 22: 611.

The author presents his observations of electrical shock based on twenty-nine years' experience with thousands of cases as Medical Director and Chief Surgeon to the Chicago Rapid Transit Company.

High frequency currents are less dangerous than low frequency. Direct current is less dangerous than alternating current. Low voltage tends to produce ventricular fibrillation if the heart is in the pathway of the current and this is fatal. Higher voltage causes inhibition of the respiratory centre in the brain. If this inhibition lasts death follows by heart failure from anoxia. If artificial respiration is applied

the patient can recover from this condition if the shock has not been too severe. Artificial respiration should be continued until it is obvious that the patient is dead in cases of this type. If the patient is thrown away from the conductor he will be less severely hurt than if he has to be pulled away. With high tension currents actual contact is not essential, as arcing may occur with resultant shock. The points of entrance and exit of the currents are the places where burns occur. Since a moist body conducts better, burns are worse in summer when the patient is wet with perspiration. In treatment first treat the shock and respiratory failure. Wait to repair fractures, etc., until the patient is out of shock. The burns are almost painless and the most important feature is their liability to secondary haemorrhage.

Glare injury to the eyes is not an actual burn but a momentary exposure to an intense source of ultra violet light. It causes blanching of the visual purple with temporary dimming of vision which disappears in forty-eight hours. There is no permanent defect. Although no current is absolutely safe the author states that he considers an alternating current of 8 to 9 milliampères and 60 cycles and a direct current of 80 milliampères are safe for practical purposes. Finally, the author states that in his opinion, apart from cases in which actual burns have destroyed the tissues during the current flow, there are no cases of resulting complications or any permanent or remote effects following electrical accidents.

GUY H. FISK

The Protection of Hearing. Dickson, E. D. D. and Ewing, A. W. G.: *J. Laryngol. & Otol.*, 1941, 56: 225.

This is an account of recent experiments, to ascertain how effective the devices now used are in the protection of the hearing organs. The tests were made in airplanes during flight, in the laboratory, and by engineers testing aircraft engines on the bench. Two types of war injury occur to the organs of hearing. One is the single explosive blast with excessive atmospheric pressure. The other is the noise of continuous and prolonged nature such as that from airplane propellers. The experimental results of the various tests are tabulated and analyzed. From these the authors conclude that complete elimination of the risk of deafness can be assured only through occlusion of the meatus combined with efficient covering of the ears. Either method applied alone reduces the danger of damage to hearing and renders the noises more tolerable. The analyses of airplane noises indicate that the noise components of middle or low frequencies may be responsible for numerous cases of deafness amongst air-force personnel. The first symptom of occupational or traumatic deafness is usually a loss of acuity to sound of a frequency of close to 4,096 ~. This, they suggest, may

be because response to such a sound is greatest in the basal turn of the cochlea which is adjacent to the middle ear and which therefore has to bear the brunt of stimulation by noise due to explosions. Effective protection against noise with the present devices diminishes the intelligibility with which speech is heard, unless telephones form part of the equipment.

GUY H. FISK

Radiology and Physiotherapy

The Roentgenologic Aspects of Subungual Glomus Tumour. Rypins, E. L.: *Am. J. Roentgen. & Rad. Therapy*, 1941, 46: 667.

The characteristic clinical finding in a glomus tumour is the extreme pain of the extremity which may be present before the tumour is visible (Humphrey and Brainard). Lewis and Geschickter record one case in which the tumour was of such minute size that it was not located until the third operative attempt. Pain is described as burning, piercing, exquisite, agonizing and bursting. Invariably the tumour is sensitive to pressure and in some cases it is associated with neurologic or vascular changes such as hyperesthesia and increase in temperature of the skin. Examination reveals a pea-sized tender tumour, which, when subungual, has almost always a peculiar bluish tinge showing through the translucent nail.

Histologically the glomus tumour is characterized by dilatation of the lumen of the Suequet-Hoyer canal and hyperplasia of the glomus cells. There is dilatation of the arterial lumina which accounts for the haemangiomatous appearance of the tumour. The glomus cells are the ones upon which the diagnosis rests. These large cuboidal cells have a circular nucleus with a well-stained reticular chromatin and a well-marked limiting membrane as shown by Masson's trichrome stain. Quoting Adair, "There is no other lesion in the entire realm of oncology which gives the tell-tale clinical features of the glomus tumour."

When the roentgenologist sees a clean-cut destruction of the cortex of a terminal phalanx a glomus tumour should be suggested as the most likely possibility for the cause of the destruction. A history of excruciating pain of the terminal phalanx, with or without a discolouration or tumour underneath the nail, and a clean-cut destruction of the cortex of a terminal phalanx is diagnostic of a glomus tumour.

R. C. BURR

Anæsthesia

Ether Convulsions. Brennan, H. J.: *Brit. M. J.*, 1941, 2: 765.

The author reviews the various theories previously advanced as to the etiology of these phenomena. They were first described simultaneously in 1927 by two Manchester anæst-

thetists, K. B. Pinson and the late S. R. Wilson. Pinson thought them due to an over-accumulation of CO₂. Wilson on the other hand believed them due to impurities in the ether such as aldehydes and peroxides. He discounts both of these theories as convulsions have occurred during endotracheal administration when the alveolar CO₂ content is at its lowest, and similarly, they have been noticed when no impurities were present and indeed when no ether was used at all. At least typical "ether convulsions" have occurred in operations under local, chloroform, and nitrous oxide anaesthetics.

It is common knowledge, however, that the combustion of heat, youth, and a septic condition with pyrexia occurs in some 85 per cent of cases and on this account the heat-stroke theory first put forward by Dickson Wright (1935) and upheld by Woolner and Taylor (1936) has received more support than any other. This paper supports and elaborates both this theory and that of neurogenic shock advanced by Hudson (1936) and explains the occurrence of the hyperpyrexia.

The author believes that ether convulsions are caused by a strong neurogenic stimulus in a hyperpyrexial patient. The hyperpyrexia is considered as due to the administration of a general anaesthetic to a dehydrated pyrexial subject in a hot humid atmosphere, the subsequent rise being possibly increased by the previous administration of atropine. The neurogenic stimuli have usually some connection with the opening or closing of the peritoneum.

Treatment consists of prevention primarily, and the elimination of the exciting factors in those subjects in whom the onset of the condition might be feared. Hot humid operating rooms should be replaced by air conditioned theatres. Dehydrated patients should be given a glucose saline drip before operation consisting of at least 1 to 2 pints. It is not considered necessary to prohibit atropine if these other factors have been attended to beforehand.

Active treatment should be followed if a convulsion occurs despite precautions. If an inhalational anaesthetic is being given it should be discontinued immediately and O₂ and CO₂ administered. All coverings should be removed from the patient and he should be cooled by spraying the limbs with cold water. The table should be placed in slight reverse Trendelenburg to relieve cerebral congestion. If, as often happens, convulsions cease temporarily in a minute or so, the patient should be intubated if this has not already been done. If convulsions have not ceased by this time a small intravenous dose of a barbiturate (pentothal) should be given. If a patient has not been intubated this must be done as soon as the barbiturate has controlled the convulsions sufficiently to make it

possible, and rhythmic insufflation with oxygen must be performed. This is most important. Barbiturates can and will save lives in ether convulsions but they can also cause fatal respiratory depression and paralysis. A case of ether convulsions which ends fatally usually does so with a cyanosed patient and a tonically contracted larynx. If the stage of the operation demands further anaesthesia with relaxation ether may be restarted or continuous barbiturate anaesthesia may be substituted. A change over to chloroform may do more harm than good.

F. ARTHUR H. WILKINSON

Pathology and Experimental Medicine

Heredity, Constitution and Tuberculosis. An Experimental Study. Lurie, M. B.: *Supp., Am. Rev. Tuberc.*, September, 1941, 44.

Six inbred rabbit families were exposed to natural respiratory contagion of tuberculosis through 4 to 5 successive inbred generations. The conclusions of the study in part are as follows: The resistance of rabbits to naturally or artificially acquired tuberculosis is a function of their genetic constitution. The inherited resistance of rabbits to artificial infection may be overwhelmed by large doses of tubercle bacilli. The genetic constitution *per se* determines whether, under given conditions of natural respiratory contagion, rabbits will acquire (a) a rapidly progressive primary generalized tuberculosis, (b) a localized chronic ulcerative pulmonary phthisis analogous to the reinfection type, or (c) a disease of a character intermediate between these extremes. The disease types acquired by rabbit families of varying inherited resistance in the investigation here reported were essentially analogous to the different types of tuberculosis developed by different human ethnic groups.

Certain families of intermediate resistance varied in the capacity of their cells to acquire inhibitory properties against the multiplication of bacilli in their cytoplasm. Some behaved like the resistant rabbits; others resembled the susceptible animals. None of them, however, acquired this property to the same degree as the former or failed to do so equally with the latter. Resistance to tuberculosis was intimately associated with the intensity and rapidity with which the tissues of the different families acquired a local immunity. The latter developed most rapidly and reached the highest degree in the most resistant family; it was slowest in development and feeble in the most susceptible families; in the families of intermediate resistance it was variable and usually intermediate in rapidity and intensity.

It is the sum total of numerous determinants that controls hereditary resistance to tuberculosis.

MADGE THURLOW MACKLIN

Hygiene and Public Health

The Diverse Etiology of Epidemic Influenza.

Lennette, E. H., Rickard, E. R., Hirst, G. K. and Horsfall, F. L.: *Pub. Health Rep.*, 1941, 56: 1777.

The first influenza virus was discovered by Stuart-Harris, Smith and Andrewes some 8 or 9 years ago. Since their discovery at least one other virus has been isolated, which is immunologically distinct. The first virus is now spoken of as influenza A and the second as influenza B. There is very good reason now to believe that other strains may exist. A number of epidemics of clinical influenza have now been investigated using neutralization and complement-fixation tests to identify the viruses involved. In these epidemics it has, in most instances, been possible to identify a predominance of influenza A or influenza B viruses, but these two viruses seem not to have been responsible for all the cases. In fact in some instances nearly half the cases have shown no increase in immune bodies specific for these two strains. The results of these studies suggest among other things: (1) that the etiology of clinical influenza is more complex than previously realized, and (2) that epidemics of influenza are apt to be due to a mixture of viruses.

FRANK G. PEDLEY

Studies on the Efficacy of a Complex Vaccine against Influenza A.

Horsfall, F. L., Lennette, E. H., Rickard, E. R. and Hirst, G. K.: *Pub. Health Rep.*, 1941, 56: 1863.

The complex vaccine used was composed of the PR8 strain of influenza A virus and the X strain of canine distemper virus. This vaccine had previously given evidence of immunizing value in animals. The individuals in the study were volunteers from 10 state institutions. The total population of these institutions was 16,295 of which 6,740 individuals were vaccinated. Eight lots of vaccine were prepared and tested by mouse titration; 7 of them appeared to be of equal potency, the 8th was much weaker. Serum was obtained from a number of volunteers before vaccination and 2 weeks after, and tested by neutralization and complement fixation tests. Comparing the neutralizing value of sera before and after vaccination (excluding the individuals vaccinated with the weaker vaccine) it was found that almost invariably the neutralizing capacity of the serum rose after vaccination. Comparison of the neutralizing capacity of the sera of 1,321 normal (*i.e.*, unvaccinated) individuals with those of 288 individuals 2 weeks after vaccination and 78 individuals 4 months after vaccination showed that many of the normal individuals had considerable amounts of neutralizing bodies in their sera, but that the vaccinated individuals generally showed a considerably higher amount. There were 1,450 cases of influenza in the 10 institutions, of which 967 were studied in order

to establish their etiology: 682 of the cases were determined as actually due to influenza A virus and 285 as due to influenza Y. The incidence of influenza A among the vaccinated and unvaccinated was not entirely consistent. In 4 of the institutions the weaker vaccine was used and in 2 of these the incidence of influenza A was actually higher among the vaccinated than among the unvaccinated. In the 6 institutions where the stronger vaccine was used the incidence of influenza A was lower among the vaccinated in every case although in one institution where the incidence was high the difference was very slight. In this particular institution 22 per cent of the unvaccinated and 21 per cent of the vaccinated contracted influenza A. On the whole, in the institutions where the stronger vaccine was used the incidence of influenza A was about 50 per cent lower among the vaccinated than among the unvaccinated. The authors interpret their results as indicating a definite protective value for the vaccine.

FRANK G. PEDLEY

Obituaries

Dr. Robert Hugh Arthur. Quietly on the evening of December 19th last Dr. Arthur, one of the truly great pioneer doctors of Canada, passed on. He was in his eighty-first year.

He was born in Bloomfield near Picton, Ont., on April 11, 1861.

Of staunch U. E. Loyalist stock, and his grandfather was the first white man to settle west of Adolphustown. The latter came by boat up Lake Ontario to the Bay of Quinte to the U. E. Loyalist settlement at Adolphustown. Here, because he did not belong to the same regiment as the majority of settlers in that district, he was not too well received. In November with his fourteen year old son, he crossed on the ice of the bay to the Carrying-Place, and decided to settle on a rise of ground at the west end of the bay. He expected to spend the winter there with a tribe of friendly Indians. Because of a small-pox epidemic the Indians did not make their annual winter pilgrimage to the lake for their winter supply of fish, and the father and son found themselves left entirely alone, to winter as best they could. In January the father returned on foot to Adolphustown, was taken ill there, and the boy of fourteen years of age was left alone to fend for himself and for the pair of oxen they had brought with them till the father returned late in March. The boy and the oxen were sheltered in a hastily constructed lean-to. The boy lived on rabbits, fish and other game, and the oxen were fed on oak leaves.

Robert attended Grammar School at Brighton, taught school for a year or two, and then decided to study medicine. When he left home for university he intended to go to Toronto, but at the station he met one of his old teachers. This particular teacher who had chastised him rather severely on several occasions during his terms in the Grammar School at Brighton, said that he also was bound for Toronto to study medicine, and as a consequence Arthur immediately decided to go to Montreal. This early trait of his character persisted throughout his life. He graduated from McGill University in 1885. The next year he spent with the late Dr. A. E. Hanna of Perth, and one or two other classmates at Dublin Infirmary.

On his return he went North with the Canadian Pacific Railway to Chapleau, Algoma Mills, and in 1892

to Sudbury. In Sudbury he formed a partnership with Dr. Struthers. They established there the first hospital, a general hospital of thirty beds, which they ran for twenty years. In 1907 Dr. W. J. Cook joined Dr. Arthur, and still later Dr. Dales. The firm was known as Drs. Arthur, Cook and Dales.

Dr. Arthur was C.P.R. doctor through all his active years of practice. As the great lumbering and mining industries developed, Struthers and Arthur, and later Cook, had camp contracts for miles east and west on the C.P.R. and north along the Canadian Northern. For many years they had one or two younger men associated with them in the camp work, and Dr. Arthur contributed much to building up the character of the great number of young medicos who were for varying periods associated with him. He was a man of firm resolve and purpose, fearless, direct, uncompromising, yet kindly, thoughtful and with a fine sense of humour. He was a doctor in the finest sense of the word, and always maintained the dignity of the profession. He exemplified in his daily life the true spirit of the *Æsculapean* oath, and had little regard or time for any member of the profession who did not.

He was prominent in the community life of Sudbury. He attended the Anglican church, and was an ardent liberal in politics. In 1922 he was elected Mayor of the city by acclamation. In an earlier mayoralty campaign he was defeated by only fourteen votes. He contested the riding for the Provincial Legislature, and for many years was its leading Liberal. He was a forceful and impressive speaker, and opposition candidates did not lightly enter debate against him.

When time permitted it he enjoyed fishing and hunting, and was the prime organizer of the Onaping Fish and Hunt Club at Windy Lake, where he spent many happy week-ends. He did not use tobacco, and, while tolerant of liquor, rarely touched any himself.

From his earliest years in the North he was active in the Militia. He was one of the original ranking officers of the Algonquin Rifles, and during the first Great War was active in its re-organization, and went overseas as Medical Officer with the 159th Battalion from Sudbury. He served in France with the 8th Canadian Stationary Hospital and No. 11 Field Ambulance. Later he was stationed at Orpington Hospital, and, after returning again to France, rejoined his old unit. On returning to Canada after the war he was again attached to the Algonquin Rifles. He retired from army life with the rank of Lieutenant-Colonel in 1926.

From 1914 to 1936 he served on the Council of the Ontario College of Physicians and Surgeons, and was President of that body in 1925 and 1926. For several years he represented the College on the Medical Council of Canada, and in 1933 and 1934 was President of that august body. For many years he was the examiner in Obstetrics and Gynaecology for the Ontario College of Physicians and Surgeons. At the spring examinations held in Kingston a somewhat dominant but dishevelled young lady doctor appeared before him for the oral examination. Not too sympathetic towards women in the profession, the doctor looked up at her, smiled and said "No doubt as a woman you have more than a passing interest in obstetrics and gynaecology—now what would you like me to question you on?" The young lady with customary feminine assurance said "Well I do not think it matters, I have just come out of an obstetrical hospital." Quick as a flash the doctor said "Aha! splendid, I hope you had an uneventful recovery."

He was a great reader. History and biographies interested him most. He had a most retentive memory for dates, incidents and anecdotes. For thirty years he wore a beard, and with his fine high forehead and massive head was an impressive figure wherever men foregathered. He had known Osler well, corresponded with him on occasions, and saw much of him during his army service overseas. In later years he rarely missed a meeting of the McGill Alumnae of Ontario, and especially enjoyed re-visiting Montreal and the evenings spent with Finley and others of about his

time. Few men in the profession enjoyed the universal esteem of other medical men that Dr. Arthur did. He was prominent in Masonic circles, and in later years was active in the Ontario Historical Association and in the U. E. Loyalist Association of Canada.

His first wife, Louise Lockwood, predeceased him in 1925, also a son Raymond, and a daughter, Dorothy. Surviving are his widow, Caroline Stull Arthur; a daughter, Mrs. J. H. Gillespie, of Toronto, and two sons, Morris, Sheriff of Sudbury, and Dr. Wilfred S. Arthur, of Toronto.

So passed a great character, a fine type of medical man, a good soldier and citizen, one who throughout his long life served well his King, his country, his faith and his profession. His great qualities of service, sacrifice, dignity, humour, kindliness and charity toward all will not soon be forgotten or dimmed by his passing.

A. L. LOCKWOOD

Dr. Percy Weeks Barker, of Vancouver, B.C., died on July 30, 1941. He was born in 1882 and a graduate of the University of Toronto (1910).

Dr. Frank Beemer, of Toronto, died on December 12, 1941. He was born in 1862 and a graduate of Victoria and University of Toronto (1884).

Dr. Owen J. Cameron, of Antigonish, N.S., died suddenly on January 9, 1942. Death followed a heart attack. He was forty-six years of age. Taking an Arts degree from St. Francis Xavier University in 1914, Dr. Cameron graduated from the Harvard Medical School in 1918, at the age of 22. Following post-graduate study in surgery he returned to Antigonish where he has been in practice for twenty years. He is survived by his father, Dr. J. J. Cameron.

Dr. Leighton Carland Conn, professor of gynaecology and obstetrics at the University of Alberta died in Edmonton, on December 22, 1941, after an illness of several months' duration, at the age of fifty-five years. He was born at Aylmer, Ontario, the son of Hugh J. Conn and Margaret Ann Cratt. He received his early education at St. Catharines, Ontario, and later proceeded to McGill University where he graduated in 1909 as Holmes gold medallist. He was an intern at the Royal Victoria Hospital for four years.

He came to Edmonton in 1913 and started a general practice. He was married to Miss Marjorie Gilmore in 1914.

Dr. Conn was head of the Department of Gynaecology and Obstetrics of the University of Alberta from the time of its inception in 1922 to 1941. He was a Fellow of the Royal College of Surgeons of Canada, Fellow of the American College of Surgeons and a Fellow of the Royal College of Obstetricians and Gynaecologists of England.

He was formerly a member of the Senate of the University of Alberta. He was a member of the Mayfair Golf and Country Club, the Edmonton Badminton Club. He was a former Rotarian. He served for many years on the advisory council of the Student Christian Movement of the University of Alberta. He was rector's warden at All Saints' Cathedral.

Besides his widow, he is survived by a son, William, and a daughter, Mrs. Ralph Arnold. His mother, Mrs. Margaret Conn, resides in Edmonton.

Dr. Theodore Ewonchuk, who was stricken while serving as senior intern in St. Boniface Hospital, Man., after his graduation in 1933, died on December 19, 1941, aged 36, at St. Boniface Sanatorium. He was born at Sarto, Manitoba.

Dr. Gerald Joseph Forster, of Belleville, Ont., died on November 27, 1941. He was born in 1885 and a graduate of the University of Toronto (1910).

Dr. George Joshua Gillam, son of John and Harriet Gillam, died in the Toronto Western Hospital on December 20, 1941, in his 56th year. He was born in Norwich, where he received his elementary education. After attending the Woodstock Collegiate Institute he went to the University of Toronto, first in Arts for one year, and then, transferring to Medicine, graduating in 1910.

A few years' general practice in Parkdale brought him to the last war and he joined the C.A.M.C. as lieutenant attached to No. 3 Stationary Hospital. As Captain he was sent to Lemnos, later to Doulens, where he saw heavy service, for which he was mentioned in despatches and given his Majority. He was demobilized in 1919 and went to London to spend some years in post-graduate study, receiving his F.R.C.S. in 1923. He was married in England to Miss Margaret Baird. On his return to Canada he resumed practice in Toronto, specializing in surgery and attached to the Toronto Western Hospital. He taught anatomy and surgery for a time in the faculty of medicine of the University of Toronto. At the time of his death he was a senior member of the Hospital for Incurables, a lecturer for St. John Ambulance, and president of the clinical society of the Toronto Western Hospital. For more than twenty years he was an Active Fellow of the Toronto Academy of Medicine, and served on the committees of ethics and publication. He was elected last year to the Council for two years.

By nature Dr. Gillam was rather reticent, but he had the gift of warm and loyal friendship, largely because of his intellectual honesty and his kindly regard for others. He belonged to that small and elect company of quiet workers to whom is given the ministry of consolation in sorrow, sickness and need, and whose devotion to their profession place spiritual above material rewards. His patients and friends will long remember him as a rich-natured, friendly man.

F.A.C.

Dr. William Alfred Lawson, of Dartmouth, died suddenly at his home, January 11, 1942. He was 66 years of age and a native of Wallace, N.S. Before his graduation from Dalhousie University in 1903 he spent several years teaching school. Following special courses in an American school Dr. Lawson practised at Harcourt, N.B. In 1920 he settled in Dartmouth. Here he became well known and his interests extended beyond medicine to shipbuilding and sea lore.

Dr. Donald J. MacDonald died at his home in Halifax, N.S., on December 19, 1941. His health had been poor for some time past, but death came with scant warning. He had been a resident of Halifax since leaving Sydney, N.S., in 1916. Dr. MacDonald was born in Whycocomagh, Cape Breton. In 1897 he graduated in medicine from McGill. In Sydney he built up an active surgical practice; in 1916 he joined the Army Medical Corps and was transferred to Halifax. Here he served through the war with the rank of major, returning to private practice in Halifax. Genial in manner, sound in his clinical judgment, Dr. MacDonald left behind many, both within the profession and beyond, who valued highly his friendship and appreciated his advice. His son, Dr. Ian MacDonald, serves with his father's rank in the R.C.A.M.C.

Dr. James Douglas MacLean, of Edmonton, passed away after several years of retirement, on November 26, 1941. He was 70 years of age at the time of his death. Born in Meaford, Ontario, he received his early education in the Province of Ontario, and entered Trinity College, Toronto, where he graduated in 1900. He registered in his own province where he practised until 1906, when he came to Alberta, opening an office in Edmonton. The greater part of his active medical life was lived there. In his later years the pioneer spirit took him to the Peace River district where he spent several years at Hythe, rendering capable service to the lone homesteaders. He leaves a host of medical and business friends to mourn his death. His widow took his ashes to Meaford for interment.

Dr. James Moore, of Brooklin, Ont., died on December 17, 1941. Born in Reach Township in 1872, he studied medicine at Trinity University where he graduated in 1899. Dr. Moore with his brother, Dr. John Moore, practised medicine in Brooklin from 1896 until 1931, at which time he was appointed Registrar of Deeds for Ontario County, succeeding the late George Dryden.

Dr. Moore, at the outbreak of the first Great War, was a company commander of the local regiment, then known as the 34th Regiment. In 1916 he went overseas with the Ontario Regiment, 116th Battalion, as medical officer. Wounded after two years' service, he returned to Canada.

Dr. Daniel Showers Sager, of Brantford, Ont., died on February 15, 1941. He was born in 1859 and a graduate of New York University (1891).

Dr. Thomas Shaw Webster, of Toronto, one of the founders of the Toronto Western Hospital died on December 30, 1941. A native of Fergus, Ont., born in 1857, Dr. Webster was once principal of its public school and later its high school. Then he came to Toronto to study medicine, and after establishing a practice here gained a wide reputation. He graduated from Victoria University, Cobourg, Ont., in 1888.

News Items

Alberta

The elections for councillors of the College of Physicians and Surgeons of Alberta resulted as follows: District No. 1, Medicine Hat, Dr. W. G. Anderson; District No. 3, Banff-Red Deer, Dr. R. Parsons; District No. 5, Peace River, Dr. A. E. Archer; District No. 7, Edmonton, Dr. T. H. Field. The only new representative on the Council is Dr. T. H. Field, of Edmonton.

The Alberta Government at the last session of the Legislature, amended the Insurance Act permitting the Government to enter into and engage in life-insurance in competition with the regular line companies. Acting on this authority, a Life Insurance Department has been organized with Ralph C. Moore as Manager. Agents and medical examiners are being appointed and business is being prepared for commencing with 1942. There is considerable protest at the action of the Department in the manner of having its medical examinations made, also limiting the work to a few of the registrants, and, while expecting a thorough examination, wanting the medical men to do the work at reduced fees. The basis of sound insurance is proper medical examinations, and anything short would bring unsatisfactory results.

The Committee of Arrangements for the Canadian Medical Association Convention in Jasper Park 1942, is leaving no stone unturned to make the meeting one of the most memorable ones in the history of our Association. Registrations should be sent in early with particulars of accommodation required. G. E. LEARMONT

British Columbia

No. 16 Canadian General Hospital is now being mobilized and in the course of time will proceed for service outside of Canada. This Unit is under the command of Colonel G. C. Kenning. This is the third fully organized Unit from British Columbia, the others being No. 13th Field Ambulance, under the command of Lieut.-Col. C. A. Watson, formerly of Victoria, which is now in Britain, and No. 12 Field Ambulance, which is under the command of Lieut.-Col. S. G. Baldwin, now training in an eastern camp.

It is reported that the Municipality of West Vancouver has arranged to make payment in respect to medical care for relief recipients.

The family of Dr. A. C. Frost of Vancouver is especially well represented in the Services. Doctor Frost served in the R.C.A.M.C. in the last war and his three sons are now on Active Service, one in each branch of the Services, the Navy, Army and Air Force, whilst the fourth son is completing his internship at the Montreal General Hospital and has applied for appointment to the R.C.A.M.C.

The list of medical men who have joined up for military service grows steadily and it is hoped at an early date to publish in the *Bulletin of the Vancouver Medical Association* a complete list for reference. It is already an imposing one.

[Although somewhat belated we have no hesitation in reproducing the following item from the *Bulletin of the Vancouver Medical Association*, December, 1941. Ed.]

The Annual Dinner of the Vancouver Medical Association was held at the Hotel Vancouver on Thursday, November 20, 1941. A large attendance, some 150 men in all enjoyed the Dinner and the entertainment provided by the Dinner Committee under the chairmanship of Dr. John A. McLean.

One item in the program seems, from what we heard, to have been more successful than any other—the conferring of the P.G.F. Degree. This Degree of "Prince of Good Fellows" is one of the highest honours our medical community can bestow on any of its members. In some ways, it is the highest. It can only be given, it cannot be worked for, and it is no use to seek it. Only those who are lovers of their kind, generous and self-denying, can hope to win this degree; and to such it comes unsought, and the spontaneous gift of their fellows. It could not have found a better, a more lovable, a more fitting recipient than this year's graduate, Dr. Charles F. Covernton. We rejoice that the Executive of this year chose him—he honours the degree, and deserves all that is said in the Latin script which conceals from the majority of us the excellence and merits of the candidate.

J. H. MACDERMOT

Manitoba

In memory of their father, the late Dr. O. Bjornson, his two daughters have offered to the University of Manitoba as annual award of \$25.00 for the best essay in English on Shakespeare and his works.

The sons of the late Dr. Charles J. Jamieson have presented to the Manitoba Curling Association in memory of their father a cup to be competed for by junior players. Dr. Jamieson was an enthusiastic curler, and always wished to encourage young men to take up the sport.

At the regular monthly meeting of the Winnipeg Medical Society held in the Medical College on December 19th, with Dr. J. C. Hossack, President, in the chair, honorary memberships were presented to Doctors R. F. Rorke, J. N. Hutchinson, H. M. Speechly, and J. R. Davidson. Each was presented with an illuminated certificate. The scientific programme was as follows: (1) "The use of the oestrogens in obstetrics and gynaecology", Dr. Brian Best. (2) "Androgen therapy", Dr. Lennox G. Bell. (3) "Sex hormones and related active products commercially available, and their actions", Professor A. T. Cameron.

ROSS MITCHELL

Plans have been made for the repetition in Winnipeg of the addresses given at the annual meeting of the Royal College of Physicians and Surgeons of Canada, November, 1941. The College has arranged for these lectures to be repeated under the auspices of the Surgeons' Club of Winnipeg, at the time of the meeting of the Clinical Surgeons Association of Western Canada.

The speakers will be Dr. A. T. Mathers, President of the College, and Colonel E. E. Archibald.

The date is February 27th and the meeting will be held in Theatre B, University of Manitoba, at 8.30 p.m. Dr. J. A. Gunn will be chairman.

New Brunswick

Dr. A. F. Chaisson who has been attached to No. 14 Field Ambulance, R.F., since its re-organization, has joined the active forces as a Captain, R.C.A.M.C. Dr. Chaisson is vacating his position in the Public Health Service in New Brunswick.

The Red Cross has established at Fredericton, the second Blood Donors Clinic in New Brunswick. The chairman of the clinic staff is Dr. J. A. M. Bell.

Acting majorities have been granted to Capt. R. A. Gregory, Capt. A. L. Winsor and Capt. A. A. Rowan, all members of the R.C.A.M.C. stationed at Saint John.

Dr. Charles MacMillan, Chief Medical Officer of the Department of Health in New Brunswick announced recently, that the Department of Health has arranged to continue the treatment of poliomyelitis cases suffering from paralysis. The department has agreed to pay hospitalization charges for a three-weeks' period where necessary, and has established a rehabilitation clinic at Fredericton which will serve the area most severely hit by the epidemic last summer. The physical therapy departments at Moncton and Saint John will serve their own local areas. For some time two trained physical therapists have been employed by the Provincial Department of Health and two other technicians are being obtained.

Dr. A. W. Clark, who for some time has been Acting Superintendent at Riverglade Sanitarium has returned to Saint John where he has been, for some years, the Medical Officer of Health.

Dr. P. Knox has resumed his position as superintendent for the Riverglade Sanitarium, much improved in health.

Dr. J. F. McInerney has established a practice at Fredericton.

A. STANLEY KIRKLAND

Nova Scotia

Gaining power in Halifax is a movement to do away with evening office hours. This horse and buggy custom, like the Martello Tower and the Town Clock, is well embedded in the rocky, native soil, and will need resolute jarring. Opposition comes not only from the employer who will free his employee for a dental, legal or hairdressing appointment, for a funeral or a parade, but never for a visit to the doctor; not only from the dear soul who tosses a coin between Fana Burner in "Passion Has Wings" and a quiet evening with her physician; opposition comes too, and strangely, from the profession. Under persistent verbal barrage of the proponents of the movement, now in view, is a motion before the Halifax Medical Society.

Amongst Nova Scotians in the Far East war zone are Dr. Henry Dickson, of Sydney (Dal. '21), Dr. Charles Bruce Chown, of Clark's Harbour (McGill '31), Dr. S. R. Brown, Shelburne (Dal. '03), Dr. Frederick Irwin (McGill '02) and Dr. Henry Dickson, Sydney (Dal. '21) in Hawaii; and Dr. Florence Murray (Dal. '19) in Korea. Dr. Jean Whittier, of Rawdon (Dal. '29), enroute home across the Pacific from India when war was declared arrived uneventfully at a western port.

There is no typhoid in Sydney but the R.C.A.M.C., stationed there, has found too many colon bacilli in

the water, perhaps due in part to overcrowding of the city and its environs. A new chlorination system is being introduced. Kentville, too, which harbours Aldershot military camp has purchased a new visible vacuum chlorinator.

Dr. A. B. Campbell, Bear River, and Dr. J. R. McCleave, Digby, have been appointed trustees of the Digby General Hospital. Dr. W. R. Dickie is vice-president of the board.

The Sutherland Memorial Hospital, Pictou, reports its busiest year in 1941, and a surplus of \$78.16.

The Gerald Burns Memorial Fund, established as a means of conveying little luxuries to the overseas confrères, ran well into four figures within a week of its inception.

Opening of the new, temporary wing to the Victoria General Hospital relieved, for the time, its over-crowded wards, as plans went on for the building of a completely new structure.

Admiral Gordon-Taylor, Vice-president of the Royal College of Surgeons, on a visit to Halifax, took part in discussion at the regular meeting of the Halifax Medical Society, at the Halifax Infirmary, and addressed the Dalhousie Student Medical Society. Introduced by Dean Grant, a former student of his at Middlesex Hospital, Admiral Gordon-Taylor mingled modern surgical lore with inspiration as he told of "total war", of its effect on private citizens, men and women, and on generations yet to come. In an effort to maintain the standards of medical education in England a dispersion plan is being carried out, whereby students are allocated to hospitals outside the zone of attack. To these hospitals, too, for example, on the outskirts of London, go post-operative cases, sometimes within a few hours of leaving the operating theatre.

High explosive injuries, said the Admiral, have changed in character since World War I. Due to the greater concussion of today's bombs fatalities are higher; the surviving injured, fewer. These suffer not as much from wounds, as from the concussion of air and water blasts, causing small retroperitoneal and peritoneal haemorrhages in the abdomen and more gross damage in the chest. He stressed the confusing clinical picture of the patient with chest injury which often stimulates an abdominal disaster, and the correct, expectant treatment of the abdominal case with minute haemorrhages only. The "crush syndrome" Admiral Taylor described graphically for his listeners.

Secondary haemorrhage and gas gangrene, he said, are much less common than in the last war, the former because of immobilizing plasters, he thought, and the latter because of the sulfonamides. More and more medical men are still needed in England, said Admiral Gordon-Taylor.

ARTHUR L. MURPHY

Ontario

The Ontario Division has taken a very forward step in adopting a single fee for membership in the Ontario Medical Association and the Canadian Medical Association. It becomes effective January 1, 1942, replacing the conjoint fee which made membership in the Canadian Medical Association optional. This is a logical development within Federation and it is to be hoped that at an early date the remaining Divisions will adopt similar procedures, bringing them in line with Alberta, Quebec and Ontario.

The Municipality of North York has been given an undertaking by representatives of St. Mary's Hospital, Toronto, to build a fully equipped general hospital in the Township of North York if the approval of the Provincial Health authorities is forthcoming. It is proposed to erect a building five storeys in height, to contain 150 rooms, at a cost of \$500,000.00, and to be completed

within two years. It is anticipated that such a hospital will fill a long-felt need in the fast-expanding northern section and its suburbs.

Plans for a \$250,000 new wing at the Toronto East General Hospital, as a war emergency, have been announced by the Chairman of the Board of Directors.

The Plan for Hospital Care, sponsored by the Ontario Hospital Association, the rates and benefits of which have been approved by the Minister of Health for Ontario, is being adopted in a number of centres.

In Brockville the Plan was discussed at a local meeting on December 5th and by December 23rd there was reported a total of 950 subscribers which included family dependents. This means that some 2,000 people in the Brockville area have provided against unexpected hospital bills.

In the Township of Nottawasaga, it was reported that, in one school section, over 50 per cent of the families have united with the Plan.

In London, it is announced that this prepaid group hospitalization will become a reality early in the year if the Medical Advisory Board of the Victoria Hospital approves of the recommendations made by the members of the Hospital Trust.

At the recent municipal elections in Toronto, Dr. Harry Glendinning was elected Alderman for Ward Two. In the School Board elections, Dr. W. H. Butt was re-elected by acclamation for Ward Seven.

Dr. Wm. W. Dow, Toronto, has been appointed Medical Director of the Toronto Mutual Life Insurance Company.

Friends of Dr. Archie McCallum, Chief Medical Officer in the Canadian Navy, are pleased to note his promotion to the rank of Acting Surgeon Captain. Other promotions announced January 2nd, Surgeon Lieutenant Chesley M. Oake of Oakville to Acting Lieutenant Commander, while A. G. Laroche has been confirmed in his acting rank of Surgeon Commander.

Ontario's Division of Tuberculosis Prevention is marking the inauguration of a new x-ray outfit taking 35 mm. films of the chest, by undertaking a chest survey of a factory in the Kitchener area, at the instance of the Division of Industrial Hygiene. This new equipment of the Department is housed in a truck which contains dressing rooms in addition to the essential equipment, takes power directly from any factory electrical circuit and is capable of making 300 to 400 chest examinations per day. A second x-ray unit already in use by the Division of Tuberculosis Prevention takes pictures on a 4 x 5 inch film. It is arranged so that it may be dismounted from its truck and temporarily installed where required. The latter was the unit used for the purpose of examining civil servants at the Parliament Buildings.

Hamilton's outstanding citizenship medal for 1941 has been presented to Dr. J. H. Holbrook, Superintendent of the Mountain Sanatorium. Presentation was made at the Annual Civic Dinner of the Hamilton Advertising and Sales Club by the Mayor of the City. In presenting the plaque and gold medal, emblematic of the person who was judged to have contributed by his personal effort, the greatest good for the greatest number, tribute was paid to Dr. Holbrook's efforts over a period of thirty years to cut the death rate from tuberculosis in the City. During his tenure of office, the death rate from tuberculosis in Hamilton has fallen from about 120 per 100,000 to well below 30.

It is announced that the old Grace Hospital Building, College and Huron Streets, Toronto, now in service as the Toronto Military Hospital, will be evacuated and become a barracks for hundreds of technical students attending special trades courses at the Central Technical School under the command of the "Canadian Army

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Vocational Wing". The Military Hospital is to be evacuated to Chorley Park, which at the present time is a military convalescent hospital. It is probable that, when the change is made, the convalescent patients now at Chorley Park may be transferred to two buildings in connection with Christie Street Hospital.

In the recently issued President's report, there is announced the establishment in the Faculty of Medicine of the University of Toronto of an Institute on Physiology under the direction of Professor C. H. Best. There are also recorded two new sub-departments in the School of Hygiene, one of a Department of Public Health Administration, and a Department of Nutrition.

Tuesday, January 6th, was the Annual Library and Historical Night of the Academy of Medicine at Toronto. The guest speaker was Professor Walter Chipman of Montreal, who addressed the Academy in Osler Hall on the subject,—"John Hunter, the Founder of Scientific Surgery".

After the address the members and guests adjourned to the Journal Room where there was an exhibit of Hunteriana, including music by Mrs. John Hunter. There was a splendid collection of various editions of Hunter's writings, of biographical material and portraits.

During the week of January 5th to 9th, the Academy sponsored a course of lectures on subjects of special interest to the practitioner. These meetings were well attended.

Appointment of Group Capt. J. W. Tice as Deputy Director of Medical Services for the Royal Canadian Air Force has been announced. Air Commodore R. W. Ryan is director.

A native of Madoc, Ont., Group Capt. Tice has had wide experience in aviation medicine since his graduation from the University of Toronto in 1921. He was for some time medical officer of the 119th Bomber Reconnaissance Squadron, which was a unit of the Auxiliary Air Force prior to the outbreak of hostilities.

Prior to joining the R.C.A.F. he was in charge of the diabetic clinic of Hamilton General Hospital.

Dr. R. F. Brown, graduate of the University of Toronto, 1928, and once a Church of England medical missionary, has been appointed medical officer of the British Embassy in Chungking.

A once choirboy at St. James' Cathedral, Dr. Brown served in the Anglican Church hospital at Kweitchow, later did work among Chinese refugees in northwest China and subsequently established his own practice in Tsingtao.

J. H. ELLIOTT

Quebec

No. 6 Field Ambulance, R.C.A.M.C., second field ambulance mobilized in Montreal has left here for active service. A third field ambulance, No. 20, which will be essentially French-Canadian in its personnel, has been recently mobilized from this district.

Lt.-Col. R. Grant Reid commands No. 6 Field Ambulance, ninth medical unit to be raised in Montreal military district since the beginning of the war, of which five have been overseas for a long time. The 200 all ranks who left the city were mainly R.C.A.M.C. personnel, but the numbers were made up by the addition of a small number of R.C.A.S.C. drivers and mechanics.

Second-in-command of the unit, which was given a good send-off by relatives and friends of the men, is Capt. H. P. Macey, and the adjutant is Capt. Fraser Gurd, grandson of the late Dr. D. Fraser Gurd.

Col. R. H. McGibbon, E.D., District Medical Officer, M.D. No. 4, again saw the unit off as he has seen every previous medical unit away, and many other units as well.

The officer personnel of the unit also includes: Capt. H. Crites, quartermaster; Capt. C. Berwick dental officer; Capt. Ronald Place, Capt. J. H. S. Geggie, Capt. L. Rice, Capt. W. S. Rodger and Lt. B. L. P. Brosseau.

La Société Médicale de Montréal tenait le 16 décembre à l'Hôtel-Dieu sa dernière séance de l'année, au cours de laquelle on procéda à l'élection du bureau pour 1942.

Le nouvel exécutif se compose comme suit: président, le docteur G.-L. Prud'homme; vice-président, le docteur Ad. Groulx; secrétaire-trésorier général, le docteur Paul Letondal, réélu pour un quatrième terme.

Après quoi, des travaux scientifiques furent présentés par les Drs Gérard Poupart, Georges-E. Cartier, Gérard St-Onge, Rodrigue Lefebvre, Pierre Meunier, Oscar Mercier, Jean-Paul Bourque et Jean-Paul Legault.

Le secrétaire général, le Dr Paul Letondal, donne ensuite lecture du rapport annuel des activités de la Société, montrant qu'elle n'a cessé de progresser depuis sa fondation et qu'elle a toujours su faire la part des événements. C'est ainsi qu'elle a mis à l'ordre du jour l'étude des grands syndrômes hémorragiques et qu'elle organisa récemment une conférence spéciale sur le traitement actuel des plaies de guerre. Elle continuera cette année à orienter ses activités dans cette voie en rapport avec les besoins de l'heure.

JÉAN SAUCIER

Saskatchewan

Only the emergencies of war would send a high ranking British surgeon travelling across Canada addressing medical societies in winter time. Surgeon Rear Admiral Gordon Gordon-Taylor, senior surgeon to Middlesex Hospital, was the guest of Regina and District Medical Society at a dinner meeting in December when he spoke on "War wounds". He said that this is a killing war, 40 per cent of wounds are fatal, so many are head and neck wounds. In other wars only 25 per cent of wounds were fatal. Children stand up to it badly. Eight out of ten wounded children die. He showed a picture of a little girl horribly wounded in the abdomen, the sole survivor from a whole block of bombed houses. She had transfusions amounting to eleven pints of blood before they could start to operate. Her case seemed hopeless but she survived. Blasting causes shattering of principal organs such as liver and spleen. He described the commander of a cruiser frightfully wounded as a result of depth charges who stayed at the bridge bringing in his ship, only to succumb before he could be helped.

He told with sorrow of the destruction of the home of the Royal College of Surgeons with its museum containing historical pathological treasures, the aorta of a king and the skeleton of a king's favourite—prized medical curiosities; the collection of skulls, the finest in the world is also gone.

Admiral Gordon-Taylor came over as a delegate to the meeting of the American College of Surgeons in Boston, but his purpose in coming was to get doctors for Britain. Now there is a shortage of general practitioners they have now only one doctor to 5,000 people. The American College of Surgeons gave him \$10,000 to help repair the bombed devastation of the Royal College of Surgeons but he obtained no doctors.

The Regina and District Medical Society, always quickly practical, sent a motion to the Canadian Medical Association asking them to make arrangements for Canadian doctors to go to England and help. Some of us wondered what had become of those cards we filled out in October, 1939, which contain a record of dependents, age, education and willingness to serve.

Dr. C. H. Andrews, who has recently returned from post-graduate study in England has taken over the practice of the late Dr. J. W. Eede, of Prince Albert.

His practice is limited to diseases of the eye, ear, nose and throat.

LILLIAN A. CHASE

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General

Rules governing the award of "The Foundation Prize" of the American Association of Obstetricians, Gynaecologists and Abdominal Surgeons.

1. The award which shall be known as "The Foundation Prize" shall consist of \$150.00.
2. Eligible contestants shall include only (a) interns, residents, or graduate students in obstetrics, gynaecology or abdominal surgery, and (b) physicians (with an M.D. degree) who are actively practising or teaching obstetrics, gynaecology or abdominal surgery."
3. Manuscripts must be presented under a nom-de-plume, which shall in no way indicate the author's identity, to the Secretary of the Association together with a sealed envelope bearing the nom-de-plume and containing a card showing the name and address of the contestant.
4. Manuscripts must be limited to 5,000 words, and must be typewritten in double-spacing on one side of the sheet. Ample margins should be provided. Illustrations should be limited to such as are required for a clear exposition of the thesis.
5. The successful thesis shall become the property of the Association, but this provision shall in no way interfere with publication of the communication in the journal of the author's choice. Unsuccessful contributions will be returned promptly to their authors.
6. Three copies of all manuscripts and illustrations entered in a given year must be in the hands of the Secretary before June 1st.
7. The award will be made at the annual meetings of the Association, at which time the successful contestant must appear in person to present his contribution as a part of the regular scientific program, in conformity with the rules of the Association. The successful contestant must meet all expenses incident to this presentation.
8. The President of the Association shall annually appoint a Committee on Award, which, under its own regulations shall determine the successful contestant and shall inform the Secretary of his name and address at least two weeks before the annual meeting. Jas. R. Bloss, M.D., Secretary, 418 Eleventh Street, Huntington, W. Va.

American Congress on Obstetrics and Gynaecology.—In this time of stress, there should be a definite interest in the welfare of the mothers and babies of the nation. The Committee which is sponsoring the next American Congress on Obstetrics and Gynaecology, to be held in St. Louis on April 6th to 10th, represents the only organization outside of governmental bodies which has attempted to unite the efforts of voluntary and other agencies to carry out the widely disseminated plans for the care of women and children. Opportunity for the presentation of advances in obstetric and gynaecologic knowledge will be afforded to the many groups interested in these problems at a nation-wide gathering of this kind. The directors of the project believe that, notwithstanding the war situation, the Congress should be held at the stated time and are proceeding with their plans to make of this an outstanding gathering. Further details of the program will be communicated as these are made available. Inquiries may be addressed to the Central Office, 650 Rush Street, Chicago, Illinois.

Culture certainly means something quite different from learning or technical skill. It implies the possession of an ideal, and the habit of critically estimating the value of things by comparison with a theoretic standard. Perfect culture should apply a complete theory of life, based upon a clear knowledge alike of its possibilities and of its limitations.—*Science and Culture*, T. H. Huxley.

Book Reviews

Infantile Paralysis; Anterior Poliomyelitis. P. Lewin. 372 pp., illust. \$7.00. McAinch, Toronto, 1941.

This is a comprehensive monograph on every aspect of the problem of poliomyelitis, excellently written. It is of value to the epidemiologist, the physician, the physiotherapist and the orthopaedic surgeon. It is of special value to the family physician, since in one small volume of three hundred and seventy pages it summarizes in clear and readable language all our knowledge of the subject. There are ample and well chosen references to guide those interested in special fields.

The early chapters are devoted to a discussion of the history, etiology, epidemiology and pathology of the disease. Then follow chapters on diagnosis, methods of examination, prognosis and mortality. The remaining two-thirds of the monograph is devoted to a detailed description of treatment of the disease in all its phases, early and late. These are all good, especially those concerned with early treatment though the chapters on the operative treatment of the late phase of the disease are excellent in their summary of the problems to be treated and the procedures which are of value.

This book can be recommended to students and practitioners as a guide to their studies in the management of a problem which is becoming increasingly more serious.

Diseases of the Blood. R. R. Kracke. 2nd ed., 692 pp., illust. \$17.50. Lippincott, Montreal, 1941.

The first edition of this volume appeared in 1937. There is no doubt that this, at the price of \$17.50, is the most expensive book on haematology on the market, and while the present edition is excellently presented, the price is exorbitant.

This edition is revised, and includes the new material in haematology developed in the last four years. New chapters on haemolytic anaemia, haemoglobinuria, and a new section on haemoglobin, its derivatives and porphyrin compound, are presented. Apt discussions on Hodgkin's disease, osteosclerotic anaemia, achrestic anaemia, ovalocytosis, omitted in the last edition, are here given. A new chapter by Dr. Craver on the treatment of leukæmia is a valuable addition; this gives the recent advance in the use of radiation and radio-active isotopes. I believe that the bibliography is more up-to-date than in the last edition.

Like its predecessor, the book is well written, and its illustrations excellent, and it should be accorded the same reception.

Trauma and Disease. Edited by L. Brahdy and S. Kahn. 2nd ed., 655 pp. \$8.60. Macmillan, Toronto, 1941.

It is not a surprise that this work should reach a second edition. It satisfies a definite need. It is true that Workmen's Compensation Boards and those physicians and surgeons who appear as expert witnesses in medico-legal cases will use it more frequently than will the profession generally. It is not, however, in any sense a book written for those alone. Trauma has long been listed in medical textbooks as an etiological factor in many diseases, but too often this is because of some long published statistics. Quite as often the effect of trauma is not mentioned, or discussed with unwarranted scepticism.

The list of contributors is imposing and the reviewer has read every chapter with sustained interest. There has been no attempt to prevent overlapping and none to prevent an occasional difference in point of view. This is rather an advantage to the reader who is seeking to form his own opinion. The fallacy of "post hoc ergo propter hoc" is everywhere disparaged. Definite postulates are stated as essential before a trauma is charged with full responsibility in a given disease. After reading the chapter on cancer one would be very cautious before accepting trauma as a cause.

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It is not invidious to the other contributors that the reviewer particularly commends the chapters on injuries to the spine and to the vascular system. The book is to be commended to teachers and to practitioners having to do with industrial accidents.

Developmental Diagnosis; Normal and Abnormal Child Development, Clinical Methods and Practical Applications. A. L. Gesell and C. S. Amatruda. 447 pp., illust. \$6.50. P. B. Hoeber, New York, 1941.

While this book is a useful one for anyone interested in the development of children it will probably be read chiefly by students, paediatricians, general practitioners and psychologists. The first quarter of the book presents a most lucid outline of the behaviour of a normal child from birth through the pre-school years. Its clarity is enhanced by well chosen charts and illustrations. The technique of determining the stage of a child's behaviour development is explained in detail for those specially interested and again is presented in a summarized form for those whose needs are more general. The authors prefer an estimate of the development quotient to that of the Intelligence Quotient. By the former term they mean an estimate of the degree of maturity based on a study of four aspects of behaviour—(1) adaptivity; (2) motor behaviour; (3) language and (4) personal social behaviour.

A good third of this treatise is given to a study of the effects of the chief abnormal conditions which affect the child's mentality and behaviour. These comprise—amentia, low and high grades, endocrine disorders, convulsions, cerebral injury and sensory handicaps of ear and eye. There is also an excellent chapter on the clinical aspects of adaptation which stresses the pitfalls of any scheme which is inadequately supervised.

The authors provide reliable guidance in seeking behaviour health in conjunction with physical health. For those of us who are not specialists in this particular field they offer a chart for recording the essential signs of development in an office visit. Throughout the book the diagnosis of abnormal behaviour and of adjustment need is emphasized rather than treatment. The authors advice on guidance is best presented in their own words. "The success of child care does not depend so much upon successful rule-of-thumb techniques as upon the underlying attitude of parents and attendants. Here lies the most promising field for medical guidance. . . ."

Applied Physiology of the Nose. A. W. Proetz. 395 pp., illust. \$7.00. Annals Pub. Co., St. Louis, 1941.

This book is written by a rhinologist for rhinologists but contains plenty of interest for the physiologist if he cares to look up the many authorities so freely referred to in the book. The general physician will find it helpful, especially the parts dealing with air-conditioning and the normal defense mechanism of the nose. The rhinologist is brought in contact with literature which is mostly out of his field.

The usual theories, repeated in many textbooks, as to the reasons for the development of the nasal accessory sinuses are questioned and the writer feels that they are only incidental to the development of the face. He also doubts the benefit of suction in the treatment of sinus disease and the possibility of vacuum as a cause of sinus headaches. The cilia of the mucous membrane receive a great deal of attention and the physician is cautioned against interfering with their action either medically or surgically. The record of the author's work on ciliary motion by moving pictures leaves no doubt as to the importance he attaches to them.

Lectures on War Neuroses. T. A. Ross. 113 pp. \$1.75. Macmillan, Toronto, 1941.

This book is based on lectures that have been given during the present war. In the preface the author states that he has tried to express his ideas as simply as possible and he has succeeded well in his attempt, for there is a notable absence of the jargon that charac-

terizes the writings of most of those who deal with the problems of psychology. However, the simplicity of the language should not mislead the reader into the belief that the subject matter is elementary or trivial. Practically the whole field of morbid psychology is covered and little is left out that is really important. The size of the book necessarily precludes details of methods of investigation and forms of therapy but any defects incident to this omission are much outweighed by the fact that mere wordiness is so rigidly avoided. The practitioner who will take the trouble to master all that may be learned from these lectures—and they are worthy of much study—will have a fairly sure grasp of the fundamentals of psychology and need not feel unduly overawed in the presence of those who talk as if it were a realm so obscure and difficult that it may be entered only by special dispensation. Common sense is the one indispensable requisite in dealing with the mentally afflicted and this short work is eminently sensible.

Diseases of the Thyroid Gland. A. E. Hertzler. 670 pp., illust. \$8.50. P. B. Hoeber, N.Y., 1941.

It is evident from the preface and throughout the book that the author through circumstances has been goaded into producing this remarkable work. The ever present theme of total thyroidectomy and goitre heart, leaves one with the impression that he is perpetually mocking his tormentors. Notwithstanding this fact and the ironical tone of the book, it is nevertheless a work of great importance, since it is a personal record of studies extending over a period of forty years.

The contents of this treatise are divided into nineteen chapters as follows: General Considerations; Normal Morphology of the Thyroid Gland; General Pathology of Goitre; Goitre in Childhood; Nontoxic Nodular Goitre; Toxic Nodular Goitre; The Cardiotoxic Goitre; Atypical Toxic Goitre; Toxic Diffuse Goitre; Thyroiditis; Myxoedema; Fetal Adenomas; Tumours of the Thyroid Gland; Goitres in Unusual Places; The Hospital Management of Goitre Patients; Hepatic Insufficiency in Toxic Goitre and its Treatment; Study of the After-Course; Topographical Anatomy of the Thyroid Gland; Technique of Operations on the Thyroid Gland.

A profusion of excellent illustrations of every physiological, and every pathological phase of the thyroid gland are presented, with the idea of proving how little we know of the subject. The author criticizes the cumbersome classification of the diseases of the thyroid gland, with excellent reasons and illustrations. He stresses the importance of complete thyroidectomy in order to prevent the goitre heart. He believes, and in every possible way tries to instil the opinion that the goitre heart can only be prevented by "bold" operation before it develops. The author is definite in his opinion that the occasional occurrence of myxoedema following total thyroidectomy has no relation to the operation. The fact that he treated with success advanced cases of myxoedema by total removal of the gland is his proof.

This is one of the books recently published really worth reading. Besides being of great scientific value, it is just as interestingly written as his former work "The Horse and Buggy Doctor". It is a most valuable, and the reviewer believes the best treatise on the subject.

BOOKS RECEIVED

National Research Council—Report of Committee on Drug Addiction 1929-1941. 1581 pp. Washington, D.C., 1941.

Static Electricity. 50 pp. \$0.35. National Fire Protection Association, Boston, 1941.

Manual of Bandaging, Splinting and Strapping. A. Thorndike, Jr. 144 pp., illust. \$1.75. Macmillan, Toronto, 1941.

Development of Occlusion. W. K. Gregory *et al.* 72 pp. \$1.50. University of Pennsylvania Press, Phila., 1941.

Supplement

NOMINAL ROLL OF MEDICAL OFFICERS, R.C.A.M.C., WHO HAVE BEEN APPOINTED TO THE ACTIVE FORCE (Army)

September 1, 1939, to November 13, 1941

We publish herewith a nominal roll of the medical officers of the Canadian Forces. These have been sent us from the office of the D.G.M.S. Lists of those serving in the Navy and Air Force are expected to follow. (Ed.)

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|--------------------|--------------------------|----------|----------------------|--------------------|
| Lt.-Col. | Abbott, C. F. | Toronto, Ont. | Capt. | Bramley-Moore, W. | Edmonton, Alta. |
| Capt. | Aberhart, W. R. | Mitchell, Ont. | Capt. | Brayley, L. G. | Port Credit, Ont. |
| Capt. | Achim, R. B. | Montreal, Que. | Major | Bridge, J. W. | Edmonton, Alta. |
| Major | Adams, F. | Windsor, Ont. | Capt. | Brooks, G. | Winnipeg, Man. |
| Capt. | Adams, G. T. | Montreal, Que. | Capt. | Brown, H. A. | Toronto, Ont. |
| Lieut. | Aiello, E. | Pincher Creek, Alta. | Capt. | Brown, L. W. | Ottawa, Ont. |
| Lieut. | Aleorn, D. E. | Victoria, B.C. | Capt. | Brown, M. M. | Winnipeg, Man. |
| Capt. | Allan, B. M. E. | Toronto, Ont. | Major | Brown, M. H. | Toronto, Ont. |
| Capt. | Allen, H. W. | Winnipeg, Man. | Major | Brown, T. M. | Trenton, Ont. |
| Capt. | Allen, J. L. | Calgary, Alta. | Capt. | Bruce, D. S. | Spalding, Sask. |
| Lieut. | Alleyn, G. G. | Quebec, Que. | Capt. | Brunet, A. J. | Montreal Que. |
| Major | Anderson, C. E. | Brooks, Alta. | Capt. | Bruser, M. | Edmonton, Alta. |
| Capt. | Anderson, J. L. M. | Victoria, B.C. | Capt. | Bondock, J. D. | Quebec, Que. |
| Capt. | Andreae, A. J. | Toronto, Ont. | Capt. | Burch, J. D. | Weyburn, Sask. |
| Capt. | Ansley, H. A. | Toronto, Ont. | Capt. | Burke, D. T. | Ottawa, Ont. |
| Col. | Archibald, E. W. | Montreal, Que. | Major | Butler, K. C. | Ottawa, Ont. |
| Major | Argue, A. F. | Montreal, Que. | Capt. | Beyers, J. N. C. | Rimbey, Alta. |
| Capt. | Archibald, B. C. | Glace Bay, N.S. | Capt. | Bagnall, A. W. | Toronto, Ont. |
| Major | Argue, H. H. | Mount Forest, Ont. | Capt. | Baird, H. E. | Chipman, N.B. |
| Capt. | Armstrong, E. C. | London, Ont. | Capt. | Baird, M. M. | Vancouver, B.C. |
| Lt.-Col. | Arnold, W. C. | Ottawa, Ont. | Major | Baird, W. S. | Vancouver, B.C. |
| Capt. | Astrof, S. | Westmount, Que. | Capt. | Baker, C. H. L. | Musquodoboit, N.S. |
| Capt. | Atkinson, H. S. | Portage la Prairie, Man. | Capt. | Baker, M. D. | Toronto, Ont. |
| Capt. | Atkinson, W. L. | Thornbury, Ont. | Capt. | Baker, R. H. | Harrow, Ont. |
| Capt. | Austmann, K. J. | Winnipeg Man. | Lt.-Col. | Baldwin, S. G. | Vancouver, B.C. |
| Capt. | Aberhart, C. | Toronto, Ont. | Capt. | Balfour, J. D. | London, Ont. |
| Lieut. | Aikens, R. L. | Montreal, Que. | Lt.-Col. | Banting, Sir F. G. | Toronto, Ont. |
| Capt. | Ainslie, E. H. | Thorndale, Ont. | | [Deceased] | |
| Capt. | Alexander, L. G. | Calgary, Alta. | Capt. | Barrette, E. | Dorchester, Que. |
| Capt. | Alleyn, C. H. | Quebec, Que. | Lieut. | Barrie, J. G. | Winnipeg Man. |
| Capt. | Anderson, B. F. | Toronto, Ont. | Capt. | Barron, R. D. | Toronto, Ont. |
| Capt. | Anderson, E. H. | Montreal, Que. | Capt. | Bates, J. F. | New Aberdeen, N.S. |
| Capt. | Andrew, J. E. | East Royalty, P.E.I. | Capt. | Bean, S. J. T. | London, Ont. |
| Capt. | Adams, H. R. | Long Branch, Ont. | Capt. | Bearden, W. A. | Newdorff, Sask. |
| Capt. | Argue, F. J. | Toronto, Ont. | Capt. | Begg, H. N. C. | Cadomin, Alta. |
| Lieut. | Anderson, J. | Winnipeg, Man. | Capt. | Bell, A. M. | Alvinston, Ont. |
| Lieut. | Adams, J. H. F. | Straffordville, Ont. | Capt. | Bell, C. G. | Lions Head, Ont. |
| Capt. | Baker, C. E. | Denzil, Sask. | Lt.-Col. | Bell, P. G. | Winnipeg, Man. |
| Capt. | Belfour, J. | Montreal Que. | Capt. | Bell, W. W. | Victoria, B.C. |
| Capt. | Balinson, R. H. | Hamilton, Ont. | Major | Belyea, C. C. | Kitchener, Ont. |
| Capt. | Banfill, S. M. | Cookshire, Que. | Capt. | Bennett, C. F. | Moose Jaw, Sask. |
| Lieut. | Barr, J. W. E. | Lanark, Ont. | Capt. | Bennett, S. Z. | Vancouver, B.C. |
| Capt. | Bastedo, G. M. | London, Ont. | Capt. | Benson, R. A. | London, Ont. |
| Capt. | Bazin, A. R. | Montreal Que. | Lieut. | Bernstein, B. | Cochrane, Ont. |
| Capt. | Belanger, P. A. | Ottawa, Ont. | Lieut. | Berry, J. R. | Toronto, Ont. |
| Capt. | Belkin, A. | Eastend, Sask. | Major | Bethune, C. M. | Halifax, N.S. |
| Capt. | Bell, J. K. | Sarnia, Ont. | Major | Bice, W. K. | London, Ont. |
| Capt. | Benaron, T. | Fort William, Ont. | Lieut. | Bieh, W. F. | Vancouver, B.C. |
| Capt. | Bensley, E. H. | Montreal Que. | Lieut. | Biehn, J. T. | Sarnia, Ont. |
| Capt. | Bernstein, P. | Cochrane, Ont. | Capt. | Bigelow, G. B. | Victoria, B.C. |
| Capt. | Blais, R. | Quebec, Que. | Lieut. | Bigelow, W. G. | Toronto, Ont. |
| Capt. | Bleeks, C. K. | Winnipeg, Man. | Capt. | Bird, E. S. | Gananoque, Ont. |
| Capt. | Blier, U. | Riviere du Loup, Que. | Capt. | Bird, G. A. | Victoria, B.C. |
| Major | Bonnell, F. H. | Vancouver, B.C. | Capt. | Bird, R. L. | Belleville, Ont. |
| Capt. | Botterell, E. H. | Toronto, Ont. | Capt. | Bissell, E. S. | Mallorytown, Ont. |
| Major | Boulter, W. L. | Vancouver, B.C. | Capt. | Bissett, G. W. C. | Duncan, B.C. |
| Capt. | Bourne, F. M. | Montreal Que. | Lieut. | Black, B. O. | Fredericton, N.B. |
| Capt. | Bowering, M. W. | Regina, Sask. | Major | Blakeman, F. W. | Ottawa, Ont. |
| Major | Bowman, F. D. | Hamilton, Ont. | Capt. | Boddington, G. D. M. | Toronto, Ont. |
| Capt. | Boxer, L. | Swift Current, Sask. | Capt. | Booth, M. L. | Wallaceburg, Ont. |
| Major | Boyd, J. | Hamilton, Ont. | Capt. | Bothroyd, W. E. | Halifax, N.S. |
| Capt. | Boyd, S. A. | Winnipeg Man. | Capt. | Borden, R. P. | Penticton, B.C. |
| Capt. | Brachman, B. | Regina, Sask. | Lieut. | Boulding, C. R. | Aurora, Ont. |
| Capt. | Bradshaw, J. A. | Hamilton, Ont. | Lieut. | Boult, G. F. | Winnipeg, Man. |
| | | | Capt. | Bourque, E. G. | Dorchester, N.B. |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|--------------------|------------------------|----------|--------------------|----------------------|
| Major | Bouthillier, G. | Shediac, N.B. | Lieut. | Cram, J. B. | Winnipeg, Man. |
| Capt. | Bowen, F. H. | Windsor, Ont. | Capt. | Cramer, R. W. I. | Guelph, Ont. |
| Capt. | Bowen, R. J. | Lambeth, Ont. | Major | Creighton, T. M. | Montreal, Que. |
| Capt. | Bowes, G. C. | Montreal, Que. | Capt. | Crosby, C. H. | Montreal, Que. |
| Lieut. | Bowie, M. R. | Essex, Ont. | Major | Cunningham, W. H. | St. Catharines, Ont. |
| Capt. | Boyd, A. R. J. | Vancouver, B.C. | Major | Calder, J. R. | Brantford, Ont. |
| Major | Boyd, W. J. | Ottawa, Ont. | Major | Caldwell, R. M. | Yarmouth, N.S. |
| Capt. | Boyden, R. W. | Toronto, Ont. | Major | Campbell, S. M. | Toronto, Ont. |
| Capt. | Brace, W. D. | Marsden, Sask. | Capt. | Cannell, D. E. | Toronto, Ont. |
| Lieut. | Bracken, E. J. | Gananoque, Ont. | Capt. | Carette, L. | Levis, Que. |
| Lieut. | Brebner, C. N. | Belleville, Ont. | Capt. | Carleton, M. | Winnipeg, Man. |
| Major | Brennan, J. W. | Toronto, Ont. | Major | Carr, W. M. | Victoria, B.C. |
| Lieut. | Broome, A. E. | Kitchener, Ont. | Capt. | Caswell, C. B. | Beamsville, Ont. |
| Lieut. | Brosseau, B. L. P. | Montreal, Que. | Lieut. | Caven, W. H. | Ottawa, Ont. |
| Lieut. | Brown, B. C. | London, Ont. | Lieut. | Chapman, E. F. | Vancouver, B.C. |
| Capt. | Brown, J. F. L. | Woodstock, N.B. | Capt. | Cherry, A. | Lethbridge, Alta. |
| Capt. | Brown, R. E. | Balcarres, Sask. | Lieut. | Chesney, L. P. | Montreal, Que. |
| Capt. | Brown, W. H. | Toronto, Ont. | Lieut. | Chestnut, H. W. | Winnipeg, Man. |
| Capt. | Brownridge, T. R. | Edmonton, Alta. | Major | Childe, A. E. | Montreal, Que. |
| Capt. | Brunton, J. F. | Hamilton, Ont. | Capt. | Chute, A. L. | Toronto, Ont. |
| Major | Buck, H. | St. Thomas, Ont. | Lieut. | Clare, D. W. | Kingston, Ont. |
| Capt. | Bucove, B. | Rockglen, Sask. | Capt. | Clark, C. W. | Winnipeg, Man. |
| Capt. | Burleigh, H. C. | Bath, Ont. | Major | Clendinnen, I. C. | Hamilton, Ont. |
| Lieut. | Burris, S. M. | Winnipeg, Man. | Capt. | Coates, K. J. | Winnipeg, Man. |
| Capt. | Burton, G. S. | Kingston, Ont. | Capt. | Coffey, T. H. | Saint John, N.B. |
| Capt. | Bustin, H. B. | Saint John, N.B. | Capt. | Cohen, W. | Montreal, Que. |
| Capt. | Cairns, R. M. | Ottawa, Ont. | Major | Coke, W. L. | Regina, Sask. |
| Major | Calhoun, J. C. | Toronto, Ont. | Capt. | Coleman, J. U. | Duncan, B.C. |
| Capt. | Calnek, S. H. | Saint John, N.B. | Capt. | Colman, H. | Prince Albert, Sask. |
| Capt. | Cameron, D. G. | Montreal, Que. | Lt.-Col. | Cone, W. V. | Montreal, Que. |
| Lt.-Col. | Cameron, H. M. | Toronto, Ont. | Capt. | Conn, R. S. | Regina, Sask. |
| Capt. | Campbell, C. A. | St. Thomas, Ont. | Major | Conover, K. I. | Montreal, Que. |
| Capt. | Campbell, D. R. | Parry Sound, Ont. | Major | Cooper, R. H. | Winnipeg, Man. |
| Capt. | Campbell, D. | Charlottetown, P.E.I. | Capt. | Copping, G. A. | Westmount, Que. |
| Capt. | Campbell, D. D. | Toronto, Ont. | Capt. | Corrigan, C. E. | Winnipeg, Man. |
| Capt. | Campbell, J. M. | Saskatoon, Sask. | Capt. | Couper, W. M. | Montreal, Que. |
| Col. | Campbell, J. G. D. | Halifax, N.S. | Capt. | Cragg, B. H. | Westminster, B.C. |
| Capt. | Campbell, R. M. | Toronto, Ont. | Capt. | Crawford, C. S. | The Pas, Man. |
| Capt. | Card, L. W. B. | Toronto, Ont. | Major | Crawford, J. N. B. | Winnipeg, Man. |
| Capt. | Carnat, M. | Ponoka, Alta. | Major | Croll, L. D. | Saskatoon, Sask. |
| Major | Carr, L. A. | Hamilton, Ont. | Lt.-Col. | Cross, C. E. | Three Rivers, Que. |
| Capt. | Carbeau, A. R. | Verdun, Que. | Capt. | Currie, G. A. W. | Regina, Sask. |
| Capt. | Carruthers, W. L. | Mount Albert, Ont. | Capt. | Curry, B. H. G. | Estevan, Sask. |
| Capt. | Carson, W. H. | Southampton, Ont. | Capt. | Dalziel, W. R. | Toronto, Ont. |
| Major | Cavanagh, J. V. A. | London, Ont. | Capt. | Davidson, I. W. | Parry Sound, Ont. |
| Capt. | Caverhill, M. R. | Victoria, B.C. | Capt. | Davis, H. R. L. | Vancouver, B.C. |
| Capt. | Chapman, H. L. | Port Arthur, Ont. | Capt. | Daymond, R. S. | Viscount, Sask. |
| Lieut. | Charles, W. B. | Toronto, Ont. | Capt. | Demers, V. C. | St. Agapit, Que. |
| Lieut. | Charpentier, J. C. | Montreal, Que. | Capt. | Desmond, F. J. | Moneton, N.B. |
| Capt. | Chisholm, M. J. | New Waterford, N.S. | Lt.-Col. | DesBrisay, H. A. | Vancouver, B.C. |
| Lieut. | Christie, H. E. | Amherst, N.S. | Capt. | De St. Victor, J. | Quebec, Que. |
| Capt. | Christopherson, E. | Vancouver, B.C. | Capt. | Dickson, R. C. | Toronto, Ont. |
| Capt. | Churchill, L. P. | Shelburne, N.S. | Major | Dillane, J. G. R. | Hamilton, Ont. |
| Lieut. | Clare, W. H. | Guelph, Ont. | Capt. | Dinan, J. J. | Montreal, Que. |
| Capt. | Clark, E. A. | Kingston, Ont. | Capt. | Duffy, J. C. | Chatham, N.B. |
| Capt. | Clarke, F. D. | Brantford, Ont. | Lieut. | Dunlop, T. C. | Weston, Ont. |
| Capt. | Clarke, K. A. C. | Calgary, Alta. | Major | Dussault, F. | Montreal, Que. |
| Major | Clement, G. H. | Vancouver, B.C. | Capt. | Dales, C. W. | Toronto, Ont. |
| Capt. | Cloutier, E. | Ansonville, Ont. | Capt. | Dauphinee, J. A. | Toronto, Ont. |
| Capt. | Cock, J. G. | Newmarket, Ont. | Capt. | Davey, E. L. | Toronto, Ont. |
| Capt. | Coddington, R. D. | Ocean Falls, B.C. | Major | Davidson, A. M. | Winnipeg, Man. |
| Lieut. | Cohen, B. H. | St. Louis, Mo., U.S.A. | Lieut. | Davidson, D. A. | Cartwright, Man. |
| Lieut. | Cole, A. B. | Toronto, Ont. | Col. | Davis, E. G. | Ottawa, Ont. |
| Capt. | Coleman, C. E. | Calgary, Alta. | Capt. | Day, C. S. | Toronto, Ont. |
| Capt. | Collison, D. B. | Vancouver, B.C. | Major | De Beaupre, E. J. | Mazenod, Sask. |
| Capt. | Colwell, H. H. | Nanaimo, B.C. | Capt. | Delahaye, A. L. | Montreal, Que. |
| Capt. | Conley, A. E. | Ottawa, Ont. | Capt. | Denney, W. L. | London, Ont. |
| Capt. | Conn, H. R. | Toronto, Ont. | Capt. | Dewar, F. P. | Toronto, Ont. |
| Capt. | Connolly, C. F. | Andrew, Alta. | Major | De Witt, C. E. A. | Wolfville, N.S. |
| Capt. | Conroy, J. B. | Montreal, Que. | Capt. | Dickey, M. R. | Saskatoon, Sask. |
| Capt. | Contway, M. A. A. | Kirkland Lake, Ont. | Capt. | Dickison, J. C. | Montreal, Que. |
| Capt. | Cornish, A. L. | Courtenay, B.C. | Lieut. | Dinberg, M. C. | Canton, N.Y., U.S.A. |
| Lieut. | Costin, P. A. | Quebec, Que. | Lieut. | Dobie, F. C. | Port Arthur, Ont. |
| Capt. | Coulter, A. R. | Weyburn, Sask. | Capt. | Dolan, R. J. | South Nelson, N.B. |
| Lt.-Col. | Courtenay, H. D. | Ottawa, Ont. | Capt. | Dougall, R. P. I. | Petrolia, Ont. |
| Lieut. | Covernton, C. C. | Vancouver, B.C. | Capt. | Douglas, R. P. | Clinton, Ont. |
| Capt. | Cowie, A. S. | Wolfville, N.S. | Lieut. | Downing, G. M. | Otterville, Ont. |
| Capt. | Coy, F. E. | Invermere, B.C. | Capt. | Downs, W. J. | Calgary, Alta. |
| Capt. | Craig, K. L. | Vancouver, B.C. | Capt. | Doyle, A. M. | Kingston, Ont. |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|--------|---------------------|----------------------|----------|----------------------|-----------------------|
| Capt. | Dubé, J. A. | Frontenac, Que. | Major | Gill, G. | Quebec, Que. |
| Lieut. | Duggan, H. E. | Red Deer, Alta. | Major | Gordon, C. A. R. | Winnipeg, Man. |
| Capt. | Dunham, B. T. | Nelson, B.C. | Lt.-Col. | Gordon, J. K. | Montreal, Que. |
| Capt. | Dunlop, W. R. | Calgary, Alta. | Capt. | Gordon, R. A. | Toronto, Ont. |
| Capt. | Dunn, N. E. | Edmonton, Alta. | Capt. | Gordon, S. G. | Toronto, Ont. |
| Capt. | Dure, F. M. | Brighton, Ont. | Major | Gossage, C. D. | Toronto, Ont. |
| Lieut. | Dyer, H. F. | Hamilton, Ont. | Major | Gosselin, J. | Quebec, Que. |
| Capt. | Earle, P. W. | Mallorytown, Ont. | Capt. | Gough, W. F. | Drummondville, Que. |
| Capt. | Edington, A. M. | Montreal, Que. | Lieut. | Graham, A. F. | Toronto, Ont. |
| Capt. | Edmison, E. R. | Toronto, Ont. | Lt.-Col. | Graham, M. D. | Ottawa, Ont. |
| Capt. | Edwards, J. C. R. | Newmarket, Ont. | Capt. | Gagne, D. S. P. | Quebec, Que. |
| Capt. | Edwards, W. S. | Ottawa, Ont. | Lieut. | Galloway, J. D. | London, Ont. |
| Lieut. | Egan, C. F. | Montreal, Que. | Capt. | Ganshorn, J. A. | Vancouver, B.C. |
| Col. | Elder, H. M. | Mimico, Ont. | Capt. | Gardner, A. J. | Cornwall, Ont. |
| Capt. | Elliott, H. N. | Winnipeg, Man. | Capt. | Geddes, A. K. | Montreal, Que. |
| Major | Elliott, M. R. | London, Ont. | Lieut. | Geggie, J. H. S. | Wakefield, Que. |
| Capt. | England, N. J. | New Waterford, N.S. | Capt. | Gilday, F. W. | Knowlton, Que. |
| Capt. | Epstein, A. A. | Vancouver, B.C. | Capt. | Gilhuly, I. K. | Winnipeg, Man. |
| Capt. | Evans, A. M. | Creighton Mine, Ont. | Capt. | Gillrie, R. B. | Mitchell, Ont. |
| Lieut. | Evans, C. C. | Winnipeg, Man. | Capt. | Gislason, H. E. | Vancouver, B.C. |
| Capt. | Evoy, G. H. | Montreal, Que. | Capt. | Glass, W. E. | Hamilton, Ont. |
| Lieut. | Eaglesham, D. C. | Amherst, N.S. | Capt. | Gliddon, E. C. | St. Thomas, Ont. |
| Capt. | Eaton, R. B. | Toronto, Ont. | Capt. | Glover, A. M. | Kingston, Ont. |
| Capt. | Edis, J. F. | Winnipeg, Man. | Lieut. | Goodman, B. | Saskatoon, Sask. |
| Major | Edmison, H. M. | Halifax, N.S. | Capt. | Gordon, A. L. | Toronto, Ont. |
| Major | Elliot, H. C. S. | Montreal, Que. | Capt. | Gordon, M. K. | Leaside, Ont. |
| Capt. | Elliot, H. W. | Winnipeg, Man. | Brig. | Gorssline, R. M. | Ottawa, Ont. |
| Capt. | Elvin, N. L. | Hamilton, Ont. | Capt. | Gould, C. E. G. | Vancouver, B.C. |
| Capt. | Ewart, H. T. | Port Arthur, Ont. | Major | Graham, C. R. | Ottawa, Ont. |
| Capt. | Ewen, W. J. | Vancouver, B.C. | Capt. | Graham, E. R. | Luseland, Sask. |
| Lieut. | Evans, S. E. | Winnipeg, Man. | Major | Graham, H. M. | Regina, Sask. |
| Capt. | Fahrni, B. M. | Vancouver, B.C. | Lieut. | Grandbois, J. | Quebec, Que. |
| Lieut. | Fahrni, W. H. | Fairbairn, L. M. | Capt. | Grant, D. K. | Winnipeg, Man. |
| Major | Falkner, K. C. | Estevan, Sask. | Lieut. | Gray, C. C. | Toronto, Ont. |
| Capt. | Feick, T. B. | Ottawa, Ont. | Major | Gray, D. W. | Ottawa, Ont. |
| Lieut. | Fell, W. A. | New Hamburg, Ont. | Lieut. | Gray, G. C. | Edmonton, Alta. |
| Lieut. | Ferguson, G. C. | Victoria, B.C. | Capt. | Gray, K. C. | Gananoque, Ont. |
| Capt. | Findlay, C. A. | Port Arthur, Ont. | Lt.-Col. | Gray, K. G. | Weston, Ont. |
| Capt. | Findlay, J. A. | Lemberg, Sask. | Capt. | Green, A. C. | Port Arthur, Ont. |
| Capt. | Fish, H. W. | Winnipeg, Man. | Capt. | Greenwood, F. C. | St. Catharines, Ont. |
| Lieut. | Flahiff, E. W. | McLennan, Alta. | Capt. | Greenwood, W. F. | Toronto, Ont. |
| Lieut. | Flett, R. O. | Toronto, Ont. | Capt. | Greer, K. C. | Toronto, Ont. |
| Capt. | Foex, H. E. | Winnipeg, Man. | Major | Gregory, A. W. | Lambeth, Ont. |
| Major | Forbes, G. R. | Chatham, Ont. | Capt. | Gregory, R. A. | Fairville, N.B. |
| Capt. | Foster, H. E. | Kentville, N.S. | Capt. | Greig, J. W. A. | Bridgewater, N.S. |
| Capt. | Fowler, A. C. | Toronto, Ont. | Capt. | Griffin, B. M. | Waterford, Ont. |
| Capt. | Fowler, J. L. A. | Perth, Ont. | Lieut. | Griffin, J. D. M. | Toronto, Ont. |
| Capt. | Fowler, W. | Toronto, Ont. | Capt. | Griffith, G. S. | Holdfast, Sask. |
| Capt. | Fraser, D. | Stratford, Ont. | Capt. | Griffith, L. A. | Halifax, N.S. |
| Major | Fraser, W. A. | Victoria, B.C. | Lt.-Col. | Groff, H. K. | Edmonton, Alta. |
| Capt. | Fremes, I. A. | Montreal, Que. | Capt. | Grondin, G. A. | Quebec, Que. |
| Capt. | Fairfield, G. C. | Benito, Man. | Lieut. | Grove, J. H. | Paisley, Ont. |
| Col. | Farmer, G. R. D. | Hamilton, Ont. | Capt. | Guimont, J. E. C. E. | Portneuf, Que. |
| Capt. | Feasby, W. R. | Toronto, Ont. | Capt. | Gundry, C. H. | Vancouver, B.C. |
| Capt. | Feehey, M. W. C. | London, Ont. | Major | Gunn, W. R. L. | Winnipeg, Man. |
| Col. | Fenwick, C. P. | Toronto, Ont. | Lieut. | Gurd, F. N. | Westmount, Que. |
| Capt. | Ferguson, G. G. | Moose Jaw, Sask. | Major | Guyatt, B. L. | Birskroaka, Ont. |
| Capt. | Ferguson, R. | Montreal, Que. | Capt. | Hair, H. C. | Toronto, Ont. |
| Capt. | Fine, H. | Toronto, Ont. | Lieut. | Hall, M. E. | Toronto, Ont. |
| Major | Fish, F. H. | Calgary, Alta. | Capt. | Hall, W. M. | Lethbridge, Alta. |
| Capt. | Fletcher, J. P. | Toronto, Ont. | Capt. | Halpenny, G. W. | Montreal, Que. |
| Lieut. | Fralleigh, S. B. | Petrolia, Ont. | Lieut. | Hamilton, E. F. B. | South Porcupine, Ont. |
| Capt. | Frank, H. F. | Langstaff, Ont. | Major | Hamilton, K. A. | Edmonton, Alta. |
| Major | Fraser, G. M. | Peterborough, Ont. | Capt. | Handford, H. L. | Renfrew, Ont. |
| Capt. | Freele, L. W. M. | Glencoe, Ont. | Capt. | Hanson, F. R. | Montreal, Que. |
| Capt. | Frost, A. C. G. | Vancouver, B.C. | Capt. | Harbeson, A. E. | Kingston, Ont. |
| Capt. | Fyshe, T. G. | Montreal, Que. | Lt.-Col. | Haszard, J. F. | Kimberley, B.C. |
| Major | Gaboury, P. C. | Outremont, Que. | Capt. | Hayter, F. W. | Alameda, Sask. |
| Capt. | Galbraith, H. S. B. | Montreal, Que. | Capt. | Henderson, H. A. | Toronto, Ont. |
| Lieut. | Gander, T. A. | Peace River, Alta. | Capt. | Henneberg, C. C. | Flin Flon, Man. |
| Capt. | Gardner, C. M. | Montreal, Que. | Major | Hicks, R. A. | Exshaw, Alta. |
| Capt. | Gardner, J. S. | Edmonton, Alta. | Lieut. | Hildes, J. A. | Toronto, Ont. |
| Major | Gerrie, J. W. | Hampstead, Que. | Major | Hill, L. R. | Toronto, Ont. |
| Capt. | Gibson, T. C. | Hamilton, Ont. | Capt. | Hill, W. H. P. | Montreal, Que. |
| Capt. | Gilchrist, W. S. | Halifax, N.S. | Capt. | Hollenberg, C. | Winnipeg, Man. |
| Capt. | Gilhooly, J. P. | Ottawa, Ont. | Lieut. | Holloway, R. W. | St. Boniface, Man. |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|----------------------|-----------------------|----------|--------------------|-----------------------|
| Capt. | Hough, H. B. | Windsor, Ont. | Lt.-Col. | Jones, A. L. | Revelstoke, B.C. |
| Major | Houston, S. W. | Kingston, Ont. | Lieut. | Jacobs, A. L. | The Pas, Man. |
| Major | Howard, M. J. | Ottawa, Ont. | Capt. | Jacobson, M. | Halifax, N.S. |
| Capt. | Howard, R. P. | Montreal, Que. | Capt. | Jaimet, C. H. | Hamilton, Ont. |
| Major | Hume, W. E. | Sherbrooke, Que. | Major | James, A. A. | Toronto, Ont. |
| Capt. | Humphreys, S. P. | Montreal, Que. | Capt. | James, E. A. | Orillia, Ont. |
| Lieut. | Hunter, H. B. M. | Reston, Man. | Capt. | Janes, E. C. | Hamilton, Ont. |
| Major | Hunter, K. A. | Vancouver, B.C. | Capt. | Jauvoish, S. | St. Vital, Man. |
| Lieut. | Hurlburt, F. W. B. | Toronto, Ont. | Lt.-Col. | Jenkins, J. S. | Charlottetown, P.E.I. |
| Capt. | Hurtig, A. | Edmonton, Alta. | Capt. | Jennings, F. C. | Saint John, N.B. |
| Capt. | Hyland, H. H. | Weston, Ont. | Lt.-Col. | Jeppson, G. L. | London, Ont. |
| Capt. | Hession, B. L. | Camp Borden, Ont. | Capt. | Johanson, A. N. | Lethbridge, Alta. |
| Lt.-Col. | Hagerman, A. R. | Toronto, Ont. | Capt. | Johnson, C. H. | Summerside, P.E.I. |
| Capt. | Haig, K. J. | Vancouver, B.C. | Lt.-Col. | Johnston, A. C. C. | Calgary, Alta. |
| Major | Haight, W. R. W. | Lancaster, Ont. | Capt. | Johnston, F. D. | Montreal, Que. |
| Lt.-Col. | Halkett, N. M. | Ottawa, Ont. | Capt. | Johnston, G. C. | Vancouver, B.C. |
| Capt. | Hall, N. B. | Campbell River, B.C. | Capt. | Johnston, W. S. | London, Ont. |
| Major | Hames, C. F. W. | Regina, Sask. | Major | Johnstone, D. S. | Regina, Sask. |
| Capt. | Hamilton, G. F. | Kitchener, Ont. | Capt. | Jones, C. M. | Halifax, N.S. |
| Lt.-Col. | Hamilton, H. P. | Toronto, Ont. | Col. | Jones, W. A. | Kingston, Ont. |
| Capt. | Hamilton, J. D. | Ponoka, Alta. | Capt. | Jose, J. G. | St. Mary's, Ont. |
| Capt. | Hamilton, R. C. M. | Fort Erie North, Ont. | Major | Jupp, J. B. | Woodstock, Ont. |
| Capt. | Hammond, A. S. | Regina, Sask. | Lieut. | Kambourian, G. S. | Montreal, Que. |
| Capt. | Hancock, G. R. | Toronto, Ont. | Lt.-Col. | Kappele, D. P. | Hamilton, Ont. |
| Lieut. | Hanna, R. J. E. | Toronto, Ont. | Capt. | Kearns, T. P. | Bothwell, Ont. |
| Capt. | Harcourt, J. A. A. | Hamilton, Ont. | Capt. | Keddy, G. W. A. | Saint John, N.B. |
| Capt. | Hardie, P. W. | Timmins, Ont. | Capt. | Keene, J. D. | Mazenod, Sask. |
| Major | Harrison, S. R. | Olds, Alta. | Major | Keillor, C. M. | Ottawa, Ont. |
| Capt. | Harvey, J. M. | Collingwood, Ont. | Capt. | Kelly, J. J. | Renfrew, Ont. |
| Capt. | Harvie, D. A. | Midland, Ont. | Capt. | Kelly, J. K. | Zeballos, B.C. |
| Lt.-Col. | Harvie, R. M. | Toronto, Ont. | Capt. | Kennedy, A. E. | Stettler, Alta. |
| Lt.-Col. | Hassard, F. R. | Bergerville, Que. | Major | Kennedy, M. J. | Sudbury, Ont. |
| Major | Hastings, R. C. | Preston, Ont. | Major | Kenner, H. B. | Stratford, Ont. |
| Lieut. | Hauch, P. P. | Viking, Alta. | Lt.-Col. | Kennaing, G. C. | Victoria, B.C. |
| Lieut. | Haworth, G. C. | Winnipeg, Man. | Major | Kenny, R. Y. | Toronto, Ont. |
| Capt. | Hay, A. W. S. | Toronto, Ont. | Capt. | Kerr, R. B. | Toronto, Ont. |
| Capt. | Hazen, J. S. | Toronto, Ont. | Lieut. | Kerster, J. K. | Ogema, Sask. |
| Major | Heaton, T. G. | Lachine, Que. | Capt. | Kilpatrick, C. D. | Blyth, Ont. |
| Capt. | Hebert, A. J. B. | Montreal, Que. | Capt. | Kinsman, J. D. | South Porcupine, Ont. |
| Lieut. | Hebert, L. | Brampton, Ont. | Capt. | Kirk, C. J. | Saskatoon, Sask. |
| Capt. | Heggie, D. C. | Timmins, Ont. | Capt. | Kirk, J. G. | Listowel, Ont. |
| Capt. | Heil, M. A. | Toronto, Ont. | Capt. | Kirouac, C. A. | Quebec, Que. |
| Lieut. | Heller, J. M. | Toronto, Ont. | Capt. | Klass, A. A. | Winnipeg, Man. |
| Capt. | Helliwell, P. V. | Toronto, Ont. | Capt. | Kobrinsky, M. T. | Toronto, Ont. |
| Capt. | Henry, W. A. | Bentley, Alta. | Capt. | Koyl, L. F. | Belleville, Ont. |
| Capt. | Hershon, H. | Outremont, Que. | Capt. | Kennedy, E. G. | Toronto, Ont. |
| Major | Hethrington, H. | Toronto, Ont. | Capt. | Kergin, F. G. | Montreal, Que. |
| Capt. | Hewitt, C. D. | Peterborough, Ont. | Lieut. | Kerr, A. L. | Montreal, Que. |
| Capt. | Hewson, R. D. | Olds, Alta. | Capt. | Kilgour, J. M. | Vancouver, B.C. |
| Capt. | Hicks, W. H. | Kinistino, Sask. | Capt. | Kirpatrick, G. M. | Montreal, Que. |
| Capt. | Hillis, L. C. | Kingsville, Ont. | Lieut. | Knox, H. C. | Mazenod, Sask. |
| Capt. | Hillsman, J. A. S. | Winnipeg, Man. | Capt. | Kobrinsky, S. | Kirkland Lake, Ont. |
| Capt. | Hitesman, R. J. | Winnipeg, Man. | Capt. | Kussner, J. | Vancouver, B.C. |
| Capt. | Hoggarth, W. B. | Ottawa, Ont. | Capt. | Laird, R. R. | Buctouche, N.B. |
| Capt. | Holland, L. G. | Halifax, N.S. | Capt. | Landry, R. D. | Winnipeg, Man. |
| Major | Holland, T. E. | Winnipeg, Man. | Capt. | Lansdown, L. P. | Granby, Que. |
| Capt. | Homans, C. O. | Hubbards, N.S. | Capt. | Laplante, J. P. | Regina, Sask. |
| Lieut. | Hoover, M. P. | Weston, Ont. | Lt.-Col. | Leech, B. C. | Vancouver, B.C. |
| Capt. | Houston, G. G. | Charlottetown, P.E.I. | Col. | Leeson, L. H. | Winnipeg, Man. |
| Capt. | Howden, W. A. | Winnipeg, Man. | Capt. | Leishman, J. D. | Carstairs, Man. |
| Lieut. | Howes, E. W. M. | Toronto, Ont. | Capt. | Lerner, A. | Montreal, Que. |
| Major | Huggard, L. H. A. R. | Vancouver, B.C. | Capt. | Letourneau, C. U. | Quebec, Que. |
| Lt.-Col. | Hughes, R. A. | Saint John, N.B. | Capt. | Levie, R. H. | Ottawa, Ont. |
| Lt.-Col. | Hunter, J. E. | Ottawa, Ont. | Brig. | Linton, J. A. | London, Ont. |
| Capt. | Hunter, J. D. | Victoria, B.C. | Capt. | Loftus, L. J. | Edmonton, Alta. |
| Capt. | Hurteau, J. L. A. | Montreal, Que. | Capt. | Long, G. S. | Guelph, Ont. |
| Capt. | Ingham, G. H. | Stratford, Ont. | Capt. | Loree, L. A. | Kingston, Ont. |
| Capt. | Inglis, W. A. N. | Westmount, Que. | Major | Luckey, L. E. R. | Montreal, Que. |
| Capt. | Inksater, H. R. | Calgary, Alta. | Col. | Lundon, A. E. | Halifax, N.S. |
| Capt. | Irvine, H. J. | Brigden, Ont. | Brig. | Luton, R. M. | Moncton, N.B. |
| Capt. | Irving, J. A. | Ottawa, Ont. | Lt.-Col. | Lyons, G. A. | Quebec, Que. |
| Capt. | Ireland, J. A. | Kamloops, B.C. | Major | Lacasse, L. J. | Quebec, Que. |
| Capt. | Ireland, P. E. | Toronto, Ont. | Lieut. | Lachance, M. | Kitchener, Ont. |
| Lt.-Col. | James, A. B. | Leaside, Ont. | Capt. | Lackner, H. A. | Owen Sound, Ont. |
| Lieut. | Jessel, S. J. | Toronto, Ont. | Major | Laird, A. F. | Pugwash, N.S. |
| Major | Johnston, B. S. | Montreal, Que. | Capt. | Langille, J. A. | Montreal, Que. |
| Capt. | Johnston, D. W. B. | Montreal, Que. | Lieut. | Lanthier, J. C. | Vancouver, B.C. |
| Capt. | Johnston, H. C. | St. Lambert, Que. | Major | Large, G. C. | |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|-------------------|----------------------------|----------|----------------------|-----------------------|
| Capt. | Laroche, M. | Lotbinière Co., Que. | Lieut. | Megill, A. H. | Ottawa, Ont. |
| Lieut. | Larocque, E. | Plantagenet, Ont. | Capt. | Meiklejohn, R. B. | Toronto, Ont. |
| Capt. | Larue, A. | Levis, Que. | Lieut. | Meltzer, H. | Ninette, Man. |
| Capt. | Laurin, B. | Three Rivers, Que. | Major | Mercier, J. P. A. J. | Quebec, Que. |
| Lieut. | Lavallee, E. | Quebec, Que. | Capt. | M'Gonigle, R. H. | St. Andrews, N.B. |
| Capt. | Lavallee, L. | Neuville, Que. | Capt. | Middleton, W. W. | London, Ont. |
| Capt. | Lawson, F. S. | Woodstock, Ont. | Major | Miller, B. F. | New Waterford, N.S. |
| Capt. | Lea, R. G. | Sudbury, Ont. | Major | Miller, R. L. | Victoria, B.C. |
| Capt. | Learoyd, D. R. | Vancouver, B.C. | Major | Miller, T. | Victoria, B.C. |
| Capt. | Leavens, C. C. H. | Picton, Ont. | Capt. | Milligan, W. A. | Cornwall, Ont. |
| Major | Leblond, S. | Quebec, Que. | Capt. | Millions, J. V. | Weyburn, Sask. |
| Lieut. | Leddy, J. E. | Toronto, Ont. | Capt. | Mills, J. R. F. | Toronto, Ont. |
| Capt. | Lee, J. G. | Toronto, Ont. | Major | Minguy, C. E. | Quebec, Que. |
| Major | Leef, C. D. S. | Halifax, N.S. | Capt. | Minnes, A. G. | Niagara Falls, Ont. |
| Lt.-Col. | Lees, F. W. | Vancouver, B.C. | Capt. | Minshull, F. A. | Halifax, N.S. |
| Lieut. | Leggett, W. G. | Toronto, Ont. | Capt. | Moffatt, W. | Toronto, Ont. |
| Capt. | Lemieux, R. | Quebec, Que. | Lieut. | Moir, H. K. | Toronto, Ont. |
| Capt. | Lewin, G. W. | Stamford Centre, Ont. | Capt. | Montemurro, G. A. | Streetsville, Ont. |
| Major | Lewis, H. W. | Battleford, Sask. | Capt. | Montgomery, G. H. | Omeme, Ont. |
| Capt. | Lewis, L. | Medicine Hat, Alta. | Capt. | Mooney, W. C. | Vancouver, B.C. |
| Capt. | Lindsay, J. G. K. | Saskatoon, Sask. | Capt. | Moore, J. H. | Kineaid, Sask. |
| Lieut. | Lindsay, R. B. | Musquodoboit Harbour, N.S. | Capt. | Morgan, J. R. E. | Toronto, Ont. |
| Capt. | Little, W. R. | Toronto, Ont. | Major | Morgan, W. C. | Belleville, Ont. |
| Major | Lochead, J. R. | Montreal, Que. | Capt. | Morris, D. B. | Windsor, N.S. |
| Capt. | Logan, H. L. | Salisbury, N.B. | Capt. | Morris, G. D. | Owen Sound, Ont. |
| Capt. | Long, R. C. | Montreal, Que. | Lieut. | Moscovitch, B. B. | Vancouver, B.C. |
| Capt. | Luke, J. C. | Montreal, Que. | Lieut. | Moss, J. K. | Hamilton, Ont. |
| Lieut. | Lunam, J. B. | Montreal, Que. | Capt. | Muir, J. A. | Port Hawkesbury, N.S. |
| Capt. | Lyons, R. | Winnipeg, Man. | Capt. | Munro, C. B. | London, Ont. |
| Capt. | MacDermot, P. N. | Montreal, Que. | Capt. | Murphy, G. H. | Halifax, N.S. |
| Capt. | MacDonald, C. J. | Halifax, N.S. | Lieut. | Murphy, H. R. | Fort William, Ont. |
| Capt. | MacDonald, C. A. | Sydney, N.S. | Capt. | Murphy, W. J. | Saint John, N.B. |
| Capt. | MacDonald, J. A. | Hastings, Ont. | Lieut. | Murray, D. R. | Toronto, Ont. |
| Capt. | MacDonald, J. B. | Montreal, Que. | Major | Murray, W. B. | Morley, Alta. |
| Capt. | MacDonald, R. I. | Toronto, Ont. | Major | Musgrove, W. M. | Winnipeg, Man. |
| Major | MacDonald, P. M. | Kingston, Ont. | Lt.-Col. | Mustard, H. R. | Vancouver, B.C. |
| Capt. | MacDougall, J. T. | Indian Head, Sask. | Lieut. | Mustard, R. A. | Toronto, Ont. |
| Lt.-Col. | Mace, W. E. | London, Ont. | Capt. | Myers, C. A. | Brussels, Ont. |
| Major | MacEwen, H. B. | Mount Royal, Que. | Lieut. | Myers, R. F. M. | Winnipeg, Man. |
| Capt. | Macey, H. P. | Freighsburg, Que. | Lieut. | McCabe, J. P. | Iona, P.E.I. |
| Capt. | MacFarland, M. T. | Cold Lake, Alta. | Lieut. | McCaffrey, F. | Quebec, Que. |
| Capt. | MacFarlane, J. C. | Westboro, Ont. | Lieut. | McCaffrey, R. P. | Vancouver, B.C. |
| Lieut. | MacIntosh, A. S. | Halifax Co., N.S. | Lieut. | McCallum, W. M. | Vancouver, B.C. |
| Capt. | MacIsaac, W. | Glace Bay, N.S. | Capt. | McCannel, J. S. | Victoria, B.C. |
| Capt. | MacKay, A. M. | New Glasgow, N.S. | Capt. | McClatchie, S. | Vancouver, B.C. |
| Capt. | MacKeen, R. A. H. | Rothesay, N.B. | Capt. | McCormick, C. P. | Toronto, Ont. |
| Capt. | MacKenzie, A. E. | Toronto, Ont. | Capt. | McCrimmon, D. R. | Montreal, Que. |
| Lieut. | MacKenzie, F. D. | Montreal, Que. | Capt. | McCullough, D. W. | Toronto, Ont. |
| Capt. | MacKinnon, A. G. | Spalding, Sask. | Lieut. | McCurdy, D. G. | Sydney, N.S. |
| Capt. | MacKinnon, C. G. | Bridgewater, N.S. | Capt. | McCutcheon, J. E. | Regina, Sask. |
| Capt. | MacLean, C. G. G. | Vancouver, B.C. | Capt. | McCutcheon, W. M. | Toronto, Ont. |
| Capt. | MacLean, T. K. | Vancouver, B.C. | Major | McDiarmid, J. M. | New Westminster, B.C. |
| Capt. | MacLellan, R. W. | Halifax, N.S. | Capt. | McDonald, W. O. | Saint John, N.B. |
| Capt. | MacLennan, J. A. | Windsor, Ont. | Capt. | McDougal, A. J. | Abernethy, Sask. |
| Capt. | MacNeill, C. H. | Campbellford, Ont. | Capt. | McFadyen, O. J. | Fairview, Alta. |
| Capt. | MacNeill, R. D. | Kensington, P.E.I. | Lieut. | McFadzean, W. T. | Brantford, Ont. |
| Capt. | MacPherson, A. W. | St. Thomas, Ont. | Capt. | McFetridge, J. G. | Winnipeg, Man. |
| Capt. | MacPherson, M. M. | Vancouver, B.C. | Lt.-Col. | McGarry, J. M. | Niagara Falls, Ont. |
| Lieut. | MacRae, A. L. | Sawyer, Que. | Col. | McGibbon, R. H. | Montreal, Que. |
| Major | Malcolm, F. F. P. | Dartmouth, N.S. | Lieut. | McGill, W. L. C. | Toronto, Ont. |
| Major | Malcolm, G. G. | Ottawa, Ont. | Major | McKay, C. O. | Saint John, N.B. |
| Capt. | Malen, D. S. | Outremont, Que. | Major | McKay, H. F. | New Glasgow, N.S. |
| Capt. | Maley, S. C. | Vancouver, B.C. | Lieut. | McKellar, J. C. | Toronto, Ont. |
| Capt. | Malone, G. M. | Morristown, N.Y., U.S.A. | Capt. | McKenty, V. J. | West Kildonan, Man. |
| Capt. | Malouf, G. M. | Saskatoon, Sask. | Capt. | McKenzie, H. | Nanton, Alta. |
| Lieut. | Mandel, J. B. | Sandy Lake, Man. | Lieut. | McKerracher, D. G. | Brockville, Ont. |
| Capt. | Manly, C. C. | Orono, Ont. | Capt. | McKibbon, W. A. | Wingham, Ont. |
| Capt. | Manning, H. E. | Winnipeg, Man. | Lieut. | McLean, F. J. | Winnipeg, Man. |
| Lieut. | Marantz, H. | Fort William, Ont. | Major | McLean, W. T. | Toronto, Ont. |
| Capt. | Markham, J. D. | Colborne, Ont. | Lieut. | McLellan, N. W. | Montreal, Que. |
| Capt. | Marshall, W. P. | Chatham, N.B. | Capt. | McLeod, J. G. | Regina, Sask. |
| Capt. | Martin, F. | Regina, Sask. | Capt. | McLeod, J. G. | Toronto, Ont. |
| Lt.-Col. | Martin, R. B. | Winnipeg, Man. | Capt. | McLeod, T. R. | Muncey, Ont. |
| Capt. | Matas, J. I. | Berwyn, Alta. | Capt. | McManus, J. P. | Garden Island, Ont. |
| Capt. | Matas, M. | Montreal, Que. | Capt. | McManus, J. F. A. | Garden Island, Ont. |
| Capt. | Mathieu, J. E. | Toronto, Ont. | Lieut. | McMurtry, T. S. G. | Vancouver, B.C. |
| Capt. | Mavety, A. F. | Montreal, Que. | Capt. | McNeel, B. H. | Toronto, Ont. |
| Lieut. | Medine, S. M. | Montreal, Que. | Capt. | McQuade, G. D. | Montreal, Que. |
| Lieut. | Medway, J. G. | Winnipeg, Man. | Capt. | McTavish, G. B. | Winnipeg, Man. |
| | | | Lieut. | Mustard, W. T. | Toronto, Ont. |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
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| Capt. | MacDonald, D. G. H. | Toronto, Ont. | Capt. | Norton, G. I. | Cardston, Alta. |
| Capt. | MacDonald, W. K. | Ottawa, Ont. | Capt. | Nykiforuk, N. E. | Edmonton, Ont. |
| Major | MacFarlane, J. A. | Toronto, Ont. | Capt. | Neilson, J. P. | Debolt, Alta. |
| Capt. | MacKay, A. F. | Oshawa, Ont. | Lieut. | Needham, W. LaV. | London, Ont. |
| Capt. | MacKenzie, D. W. | Montreal, Que. | Major | Neilson, C. P. | Winnipeg, Man. |
| Col. | MacKenzie, J. C. | Montreal, Que. | Capt. | Neilson, J. B. | Hamilton, Ont. |
| Capt. | MacKenzie, K. R. | Montreal, Que. | Capt. | Nelson, F. H. | Stratford, Ont. |
| Capt. | MacKinnon, W. B. | Winnipeg, Man. | Lt.-Col. | Nettleton, J. M. | Penetanguishene, Ont. |
| Capt. | MacLaren, R. D. | Whitby, Ont. | Lieut. | Neville, J. D. | Camrose, Alta. |
| Major | MacLean, D. L. | Toronto, Ont. | Capt. | Newell, C. | Toronto, Ont. |
| Capt. | MacLean, H. M. | Moncton, N.B. | Lieut. | Nichol, J. E. | Ottawa, Ont. |
| Capt. | MacLean, I. S. | Winnipeg, Man. | Capt. | Nicholson, M. A. | Victoria, B.C. |
| Capt. | MacLeod, B. A. | Fort William, Ont. | Lieut. | Nix, H. L. | Red Deer, Alta. |
| Capt. | MacLeod, D. R. E. | Toronto, Ont. | Capt. | Noonan, W. T. | Toronto, Ont. |
| Capt. | MacMillan, J. A. | Vancouver, B.C. | Capt. | Norman, H. R. C. | Toronto, Ont. |
| Capt. | MacNaughton, E. A. | Montreal, Que. | Lieut. | Nutik, H. L. | Montreal, Que. |
| Lieut. | MacNeill, A. L. H. | Shaunavon, Sask. | Capt. | O'Brien, H. D. | Halifax, N.S. |
| Capt. | MacPherson, A. D. | Ponoka, Alta. | Capt. | Ohlke, R. F. | Parry Sound, Ont. |
| Capt. | MacPherson, G. B. | Guelph, Ont. | Capt. | Oliver, G. D. | Vancouver, B.C. |
| Major | Mader, V. O. | Halifax, N.S. | Major | Olson, B. H. | Winnipeg, Man. |
| Capt. | Magner, D. E. O'C. | Toronto, Ont. | Lieut. | O'Neill, W. F. H. | Winnipeg, Man. |
| Capt. | Maloney, P. J. | Ottawa, Ont. | Lieut. | Orchard, C. B. | Tisdale, Sask. |
| Lt.-Col. | Martin, S. J. | Montreal, Que. | Capt. | Oborne, H. G. | Vancouver, B.C. |
| Capt. | Mathews, W. H. | Montreal, Que. | Capt. | Ogulnik, V. F. | Westmount, Que. |
| Capt. | Melanson, H. P. | Moncton, N.B. | Capt. | Oille, W. A. | Toronto, Ont. |
| Capt. | Melanson, J. A. | Moncton, N.B. | Capt. | Ostiguy, L. | Montreal, Que. |
| Capt. | Merritt, J. W. | Waterloo, Ont. | Capt. | Overholt, A. A. | Brantford, Ont. |
| Capt. | M'Gonigle, A. C. R. | Toronto, Ont. | Capt. | Pace, F. C. | Westmount, Que. |
| Capt. | Middlebro, A. S. | Fort William, Ont. | Capt. | Palmer, J. H. | Ottawa, Ont. |
| Lieut. | Middlebro, J. P. | Owen Sound, Ont. | Major | Parney, F. S. | Paris, Ont. |
| Capt. | Midgley, G. H. | Galt, Ont. | Capt. | Patterson, E. B. | Gifford, Que. |
| Capt. | Miller, B. C. | Westboro, Ont. | Lt.-Col. | Petitclerc, J. L. | Montreal, Que. |
| Major | Miller, J. M. | Moose Jaw, Sask. | Capt. | Petrie, J. G. | Quebec, Que. |
| Capt. | Miller, J. S. | Halifax, N.S. | Capt. | Pfeiffer, W. M. | Guelph, Ont. |
| Capt. | Milne, D. R. S. | Vancouver, B.C. | Capt. | Pinch, J. C. | Montreal, Que. |
| Capt. | Milner, F. J. | London, Ont. | Lt.-Col. | Plante, A. P. | Hamilton, Ont. |
| Capt. | Miron, D. | Outremont, Que. | Capt. | Lt.-Col. Playfair, C. H. | Lillooet, B.C. |
| Major | Mirsky, S. | Ottawa, Ont. | Capt. | Ployart, C. H. | Saint John, N.B. |
| Capt. | Misener, C. C. | Crediton, Ont. | Capt. | Porter, D. F. W. | Belleville, Ont. |
| Major | Mitchell, H. S. | Mount Royal, Que. | Capt. | Potter, R. T. | Ottawa, Ont. |
| Capt. | Mitchell, M. D. | Maple Creek, Sask. | Capt. | Procter, H. A. | Brantford, Ont. |
| Capt. | Moll, A. E. | Montreal, Que. | Capt. | Palmer, H. I. | Regina, Sask. |
| Lt.-Col. | Montgomery, L. C. | Westmount, Que. | Capt. | Palmer, W. M. R. | Quebec, Que. |
| Major | Montgomery, R. C. | Toronto, Ont. | Capt. | Paradis, P. | Louisiana, U.S.A. |
| Major | Morgan, G. S. | Montreal, Que. | Capt. | Park, M. O. | Edmonton, Alta. |
| Capt. | Morin, J. E. | Quebec, Que. | Capt. | Parlee, S. S. | Ottawa, Ont. |
| Capt. | Morson, W. G. | Halifax, N.S. | Capt. | Patterson, J. C. | Ottawa, Ont. |
| Capt. | Muirhead, W. R. | Carleton Place, Ont. | Capt. | Patterson, J. F. | Chilliwack, B.C. |
| Major | Mulligan, C. V. | North Toronto, Ont. | Capt. | Patten, R. W. | Montreal, Que. |
| Capt. | Mundell, C. D. T. | Montreal, Que. | Major | Patterson, W. J. | Westboro, Ont. |
| Capt. | Murray, R. D. | Markdale, Ont. | Capt. | Peart, A. F. W. | Wallaceburg, Ont. |
| Capt. | Murtagh, A. P. | Timmins, Ont. | Capt. | Peco, H. C. | Stirling, Ont. |
| Lieut. | Mustard, W. T. | Toronto, Ont. | Capt. | Pedley, W. H. | Colborne, Ont. |
| Capt. | Mutrie, E. T. | Elora, Ont. | Capt. | Pember, F. R. | Saint John, N.B. |
| Capt. | Mutrie, R. R. | Guelph, Ont. | Major | Pendrigh, R. M. | Mimico, Ont. |
| Capt. | McCarroll, J. G. | Port Arthur, Ont. | Capt. | Pennal, G. F. | Toronto, Ont. |
| Major | McCart, H. W. D. | Toronto, Ont. | Capt. | Perfect, K. E. | Welland, Ont. |
| Capt. | McCormack, C. W. | Renfrew, Ont. | Capt. | Perrett, T. S. | Cowansville, Que. |
| Col. | McCusker, E. A. | Regina, Sask. | Capt. | Perron, S. | Toronto, Ont. |
| Capt. | McCutcheon, C. W. V. | Toronto, Ont. | Lieut. | Phair, W. B. | Brantford, Ont. |
| Capt. | McDonald, A. D. | New Waterford, N.S. | Capt. | Plewes, D. F. | Montreal, Que. |
| Capt. | McGarry, G. C. | Niagara Falls, Ont. | Lieut. | Place, R. E. G. | Tecumseh, Ont. |
| Capt. | McGillivray, N. B. | Toronto, Ont. | Lt.-Col. | Poisson, P. | Quebec, Que. |
| Capt. | McGovern, J. E. | Montreal, Que. | Capt. | Pollack, S. L. | Kingston, Ont. |
| Major | McInerney, J. P. | Saint John, N.B. | Major | Polson, S. M. | Revelstoke, B.C. |
| Lt.-Col. | McIntosh, C. A. | Montreal, Que. | Lieut. | Poole, J. C. | Toronto, Ont. |
| Capt. | McIntosh, J. D. | Fort William, Ont. | Capt. | Poynz, L. K. | Toronto, Ont. |
| Lt.-Col. | McKay, W. W. | Ottawa, Ont. | Capt. | Procunier, C. W. | Lucknow, Ont. |
| Capt. | McKenna, L. B. | London, Ont. | Capt. | Procunier, F. A. | Edmonton, Alta. |
| Capt. | McKercher, A. E. | London, Ont. | Capt. | Quehl, E. | Montreal, Que. |
| Major | McKinnon, N. E. | Downsview, Ont. | Capt. | Quinn, L. J. | Fort Coulonge, Que. |
| Capt. | McLaughlin, J. A. | Saint John, N.B. | Capt. | Rabb, H. R. | Montreal, Que. |
| Capt. | McNicoll, H. L. | Flin Flon, Man. | Major | Rabinowitch, I. M. | Toronto, Ont. |
| Capt. | Negru, J. H. | Montreal, Que. | Col. | Rae, C. A. | Port Colborne, Ont. |
| Capt. | Nicholson, J. F. | Sydney, N.S. | Capt. | Railton, S. V. | Toronto, Ont. |
| Capt. | Nixon, J. R. | Edmonton, Alta. | Capt. | Ralph, R. E. | Turtleford, Sask. |
| Major | Noble, J. A. | Halifax, N.S. | Capt. | Ramsay, F. G. | Fort William, Ont. |
| Capt. | Nodwell, R. J. | Esquimalt, B.C. | Capt. | Rathbone, E. D. | |
| Capt. | Norris, R. L. | Wyoming, Ont. | | | |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|-------------------|------------------------------|----------|---------------------|---------------------------|
| Capt. | Raymond, G. H. | Montreal, Que. | Capt. | Scott, H. J. | Winnipeg, Man. |
| Lieut. | Rennie, C. S. | Vancouver, B.C. | Capt. | Scott-Moncrieff, R. | Victoria, B.C. |
| Capt. | Richardson, A. L. | Petitecodiac, N.S. | Lieut. | Searle, A. | Winnipeg, Man. |
| Capt. | Richardson, J. C. | Toronto, Ont. | Capt. | Secter, M. B. | Buchanan, Sask. |
| Major | Richardson, R. W. | Winnipeg, Man. | Capt. | Seguin, G. A. | Montreal, Que. |
| Major | Robert, L. P. | Montreal, Que. | Capt. | Selnick, M. W. | Toronto, Ont. |
| Capt. | Robertson, C. T. | Toronto, Ont. | Capt. | Share, M. | Edmonton, Alta. |
| Capt. | Robertson, D. P. | Toronto, Ont. | Capt. | Shaw, J. H. | Charlottetown, P.E.I. |
| Capt. | Robertson, H. A. | Vancouver, B.C. | Capt. | Sherk, B. E. | Fenwick, Ont. |
| Capt. | Robertson, H. R. | Montreal, Que. | Lieut. | Shier, C. B. | Toronto, Ont. |
| Capt. | Robson, G. W. | Regina, Sask. | Capt. | Shier, L. V. | Lindsay, Ont. |
| Lieut. | Roddick, J. E. | Ohsweken, Ont. | Capt. | Shipley, M. | Calgary, Alta. |
| Major | Roderick, J. H. | Ancaster, Ont. | Capt. | Shklov, N. | Vancouver, B.C. |
| Capt. | Rose, W. H. | Potsdam, N.Y., U.S.A. | Capt. | Shragovitch, I. | Outremont, Que. |
| Lt.-Col. | Ross, A. | Montreal, Que. | Major | Sieniewicz, T. M. | Halifax, N.S. |
| Major | Ross, E. F. | Halifax, N.S. | Lieut. | Sills, H. L. | Windsor, Ont. |
| Capt. | Ross, H. R. | Sydney, Cape Breton | Capt. | Simard, M. P. | Rimouski, Que. |
| Major | Rothwell, J. C. | Quebec, Que. | Capt. | Sinclair, A. B. | Toronto, Ont. |
| Major | Rumball, A. St.C. | Brandon, Man. | Lieut. | Sinclair, J. W. | Timmins, Ont. |
| Lt.-Col. | Russel, C. K. | Westmount, Que. | Lieut. | Sloan, W. L. | Toronto, Ont. |
| Capt. | Ryan, P. A. | Toronto, Ont. | Lieut. | Slocombe, G. W. | Selkirk, Ont. |
| Capt. | Rykert, H. E. | Toronto, Ont. | Capt. | Smith, G. F. | Toronto, Ont. |
| Capt. | Rabson, L. R. | Winnipeg, Man. | Capt. | Smith, R. L. | Montreal, Que. |
| Capt. | Ramey, F. F. | Fredericton, N.B. | Capt. | Smith, T. C. | Kingston, Ont. |
| Lt.-Col. | Rankin, A. C. | Ottawa, Ont. | Lieut. | Smolkin, S. | Almonte, Ont. |
| Capt. | Ranney, M. G. | Callander, Ont. | Lt.-Col. | Snell, A. E. | Ottawa, Ont. |
| Lt.-Col. | Ratz, R. G. | Kitchener, Ont. | Major | Soper, W. H. | Charlottetown, N.S. |
| Capt. | Rawson, N. R. | Winnipeg, Man. | Lieut. | Sormany, A. H. | Edmundston, N.B. |
| Capt. | Raynor, E. F. | West Vancouver, B.C. | Capt. | Souter, A. W. | Halifax, N.S. |
| Capt. | Reeds, W. R. | Agincourt, Ont. | Major | Spence, J. M. | Toronto, Ont. |
| Lieut. | Reeves, R. L. | Ottawa, Ont. | Capt. | Spence, P. M. | Toronto, Ont. |
| Lt.-Col. | Reid, F. L. | Trenton, Ont. | Capt. | Spencer, E. W. | Saskatoon, Sask. |
| Lt.-Col. | Reid, J. A. | Calgary, Alta. | Lieut. | Spooner, E. G. | Regina, Sask. |
| Lieut. | Reid, J. A. G. | Toronto, Ont. | Major | Spooner, H. J. | Toronto, Ont. |
| Lt.-Col. | Reid, R. G. | Westmount, Que. | Capt. | Sproule, H. F. | Mt. Dennis, Ont. |
| Capt. | Renton, G. W. | Windsor, Ont. | Lieut. | Squire, J. B. | Saint John, N.B. |
| Lieut. | Revell, D. G. | Winnipeg, Man. | Lt.-Col. | St.-Amand, G. | Loretteville, Que. |
| Capt. | Rice, L. W. | Montreal, Que. | Capt. | Statten, T. | Toronto, Ont. |
| Capt. | Rice, R. W. | Victoria, B.C. | Capt. | Stevens, B. W. | Quebec, Que. |
| Lieut. | Rice, R. G. | Montreal, Que. | Lt.-Col. | Stevenson, J. | Vancouver, B.C. |
| Lieut. | Rich, C. B. | Edmonton, Alta. | Capt. | Stewart, A. J. | Hamilton, Ont. |
| Capt. | Richardson, T. M. | Verdun, Que. | Capt. | Stewart, D. W. | Blairmore, Alta. |
| Capt. | Riddell, L. H. | Winnipeg, Man. | Capt. | Stewart, R. F. | Winnipeg, Man. |
| Capt. | Riddolls, W. E. | Brantford, Ont. | Major | Stirling, J. T. | Vancouver, B.C. |
| Capt. | Ritchie, K. S. | Montreal, Que. | Capt. | Stoker, G. L. | Ottawa, Ont. |
| Major | Robertson, B. D. | Montreal, Que. | Lt.-Col. | Stone, E. L. | Vancouver, B.C. |
| Lieut. | Robertson, J. A. | Campbellford, Ont. | Capt. | Stringer, F. H. | Glace Bay, N.S. |
| Capt. | Robinson, R. B. | Toronto, Ont. | Capt. | Sutherland, H. F. | Amherst, N.S. |
| Capt. | Rodger, W. S. | Cowansville, Que. | Major | Sutherland, J. W. | Pictou, N.S. |
| Capt. | Roger, J. P. | Quebec, Que. | Lt.-Col. | Sutherland, R. H. | Revelstoke, B.C. |
| Capt. | Ross, A. G. | Elk Point, Alta. | Major | Sutherland, T. W. | Moose Jaw, Sask. |
| Major | Ross, J. W. | Toronto, Ont. | Capt. | Swanton, A. L. | Cranbrook, B.C. |
| Major | Ross, J. R. | Toronto, Ont. | Lieut. | Swartz, M. J. | Banff, Alta. |
| Capt. | Rostrup, O. M. | Edmonton, Alta. | Capt. | Scott, A. W. | Toronto, Ont. |
| Lieut. | Roulston, T. J. | Regina, Sask. | Major | Sarjeant, T. R. | Montreal, Que. |
| Capt. | Rowan, A. A. | Fredericton, N.B. | Capt. | Scharfe, E. E. | Penetanguishene, Ont. |
| Capt. | Roy, A. | St. Remi, Que. | Capt. | Scheinert, J. | St. Vital, Man. |
| Capt. | Roy, A. | St. Michel de Squathee, Que. | Capt. | Schoemperlen, C. B. | Vancouver, B.C. |
| Major | Roy, P. | Quebec, Que. | Capt. | Scott, H. | Picton, Ont. |
| Lieut. | Rubin, M. | Foam Lake, Sask. | Capt. | Scott, P. A. | Guelph, Ont. |
| Capt. | Rudd, E. J. K. | Montreal, Que. | Capt. | Scott, W. A. | Montreal, Que. |
| Lt.-Col. | Ruddick, W. W. | Montreal, Que. | Capt. | Shannon, J. G. | Toronto, Ont. |
| Capt. | Rutenberg, L. I. | Vancouver, B.C. | Capt. | Shaw, A. G. | Toronto, Ont. |
| Capt. | Ryan, C. A. | Winnipeg, Man. | Major | Shier, S. G. U. | Forest Hill Village, Ont. |
| Capt. | Ryan, G. H. | Edmonton, Alta. | Capt. | Shipp, F. L. | Grimsby, Ont. |
| Lieut. | Rich, C. B. | Rouleau, Sask. | Lt.-Col. | Sinclair, G. A. | Toronto, Ont. |
| Lieut. | Singleton, A. H. | Kingston, Ont. | Major | Singleton, A. E. | Rouleau, Sask. |
| Major | Salsbury, C. R. | Wynyard, Sask. | Lieut. | Singleton, A. H. | Trenton, Ont. |
| Lieut. | Salter, A. W. | Toronto, Ont. | Capt. | Slack, W. R. I. | Dartmouth, N.S. |
| Lieut. | Samis, J. C. | Toronto, Ont. | Capt. | Slayter, J. H. | Bowmanville, Ont. |
| Lieut. | Sanderson, C. G. | Vancouver, B.C. | Lieut. | Slemon, H. V. | Ottawa, Ont. |
| Capt. | Saunders, T. F. | Ocean Falls, B.C. | Capt. | Smail, W. D. | Winnipeg, Man. |
| Lieut. | Saxton, G. D. | Sarnia, Ont. | Major | Smith, F. H. | Ottawa, Ont. |
| Capt. | Scarow, G. R. | Regina, Sask. | Major | Smith, G. L. M. | British Guiana |
| Major | Schroeder, F. W. | Orillia, Ont. | Capt. | Sneath, P. A. T. | Nipawin, Sask. |
| Major | Scott, C. V. | Wiarton, Ont. | Capt. | Solomon, B. W. | Winnipeg, Man. |
| Capt. | Scott, D. E. | Ottawa, Ont. | Capt. | Sommerville, A. N. | Montreal, Que. |
| Major | Scott, G. O. | | Capt. | Sparling, D. W. | Ottawa, Ont. |
| | | | Capt. | Spooner, C. M. | Trenton, Ont. |
| | | | Capt. | Stephen, H. M. | |

| Rank | Name | Town and Province | Rank | Name | Town and Province |
|----------|---------------------|---------------------------|----------|---------------------|-------------------------|
| Capt. | Stevenson, R. H. | Montreal, Que. | Lt.-Col. | Wannop, G. G. | Wetaskiwin, Alta. |
| Capt. | Stewart, O. W. | Montreal, Que. | Capt. | Warner, W. P. | Toronto, Ont. |
| Capt. | Stiles, E. | Albert, N.B. | Lt.-Col. | Warren, D. A. | Hamilton, Ont. |
| Capt. | Stockwell, W. C. | Montreal, Que. | Capt. | Warren, W. J. | Alex, Alta. |
| Capt. | Strain, F. A. | Gore Bay, Ont. | Capt. | Watkinson, E. A. | Kingston, Ont. |
| Capt. | Stratton, H. G. | New Toronto, Ont. | Major | Watson, C. A. | Victoria, B.C. |
| Lt.-Col. | Stuart, L. M. | Guelph, Ont. | Capt. | Watson, C. H. | Toronto, Ont. |
| Capt. | Sturdy, J. H. | Revelstoke, B.C. | Lt.-Col. | Watson, M. C. | Toronto, Ont. |
| Capt. | Sutherland, D. R. | Halifax, N.S. | Lieut. | Watts, G. O. | Toronto, Ont. |
| Major | Sutherland, J. L. | Halifax, N.S. | Capt. | Weber, J. J. | Woodstock, Ont. |
| Capt. | Sutton, I. | Long Branch, Ont. | Capt. | Weekes, W. E. | Exeter, Ont. |
| Capt. | Tanner, A. R. | Winnipeg, Man. | Lieut. | Weissgerber, L. A. | Gore Bay, Ont. |
| Capt. | Tanton, G. P. | Port Dufferin, N.S. | Capt. | Wells, J. P. | Orillia, Ont. |
| Capt. | Taylor, C. D. | Montreal, Que. | Capt. | Wells, T. J. | Beebe, Que. |
| Capt. | Temple, A. D. | Kingston, Ont. | Lieut. | West, W. G. | Woodstock, Ont. |
| Capt. | Templeton D. W. | Kamloops, B.C. | Capt. | Whepley, E. H. | Angusville, Man. |
| Major | Tennant, P. S. | London, Ont. | Capt. | White, I. S. | Port Coquitlam, B.C. |
| Major | Thompson, F. G. | Toronto, Ont. | Capt. | Whitelock, C. K. | Niagara Falls, Ont. |
| Capt. | Tilley, J. V. | Winnipeg, Man. | Capt. | Whiteside, W. C. | Edmonton, Alta. |
| Capt. | Tisdale, P. K. | Wingham, Ont. | Lieut. | Whitman, R. L. | Vancouver, B.C. |
| Capt. | Torrance, T. L. | Louisburg, N.S. | Capt. | Whitmore, A. E. | Vancouver, B.C. |
| Capt. | Townsend, H. J. | Halifax, N.S. | Capt. | Wilder, E. M. | Killam, Alta. |
| Capt. | Trask, C. R. | Toronto, Ont. | Lieut. | Will, R. E. | Barrie, Ont. |
| Lieut. | Traynor, J. A. | Halifax, N.S. | Capt. | Williams, C. D. G. | Toronto, Ont. |
| Major | Tremblay, P. | Toronto, Ont. | Capt. | Williams, C. F. | Ottawa, Ont. |
| Capt. | Truax, A. J. | Halifax, N.S. | Capt. | Williams, H. A. | Kitchener, Ont. |
| Capt. | Tureot, E. A. | Toronto, Ont. | Capt. | Williams, H. I. | Montreal, Que. |
| Capt. | Turnbull, A. | Montreal, Que. | Capt. | Williams, W. O. | North Augusta, Ont. |
| Lieut. | Talbot, H. S. | Victoria, B.C. | Lt.-Col. | Willoughby, J. B. | Napanee, Ont. |
| Major | Tanzman, J. | Brewster, N.Y., U.S.A. | Major | Wilson, J. C. | London, Ont. |
| Major | Taylor, A. H. | Saint John, N.B. | Lieut. | Wilson, K. E. G. | Ottawa, Ont. |
| Capt. | Taylor, G. D. L. | Goderich, Ont. | Major | Wilson, N. K. | Toronto, Ont. |
| Capt. | Taylor, R. M. | Montreal, Que. | Capt. | Wilson, W. M. G. | Kamloops, B.C. |
| Major | Taylor, R. B. | Toronto, Ont. | Capt. | Winsor, A. L. | Norton, N.B. |
| Capt. | Telfer, G. W. | Montreal, Que. | Lieut. | Wodehouse, G. E. | Rockliffe, Ottawa, Ont. |
| Capt. | Tellson, A. G. | Kingston, Ont. | Lieut. | Wollin, D. G. | Ingersoll, Ont. |
| Capt. | Terry, K. | Toronto, Ont. | Capt. | Wolochow, P. | Mayerthorpe, Alta. |
| Major | Tessier, J. E. A. | Nelson, B.C. | Capt. | Wolstein, E. | Ottawa, Ont. |
| Lieut. | Thibault, J. | Quebec, Que. | Capt. | Wood, D. M. | Limerick, Sask. |
| Capt. | Thibault, M. A. G. | St. Camille, Que. | Capt. | Wood, G. W. | Montreal, Que. |
| Lt.-Col. | Thompson, C. S. | Sherbrooke, Que. | Lt.-Col. | Wood, J. H. | Toronto, Ont. |
| Capt. | Thoms, A. E. | Hampstead, Que. | Capt. | Wood, L. G. | Vancouver, B.C. |
| Capt. | Thomson, J. A. C. | Madoc, Ont. | Lieut. | Wood, W. J. | Winnipeg Man. |
| Capt. | Tieman, E. E. | Toronto, Ont. | Capt. | Worsley, G. H. | Winnipeg, Man. |
| Capt. | Tough, F. W. K. | Ottawa, Ont. | Capt. | Wride, R. J. | Princeton, B.C. |
| Capt. | Tovee, E. B. | Toronto, Ont. | Capt. | Wright, J. G. | Regina, Sask. |
| Major | Towers, T. L. | London, Ont. | Col. | Wright, R. P. | Montreal, Que. |
| Lieut. | Tritt, J. H. | Regina, Sask. | Lieut. | Wyatt, J. P. | Toronto, Ont. |
| Major | Trudelle, J. B. | Vancouver, B.C. | Capt. | Walker, N. L. | Orillia, Ont. |
| Capt. | Trueman, G. E. | Winnipeg, Man. | Capt. | Waller, K. B. | Rockwood, Ont. |
| Capt. | Tucker, F. R. | Edmonton, Alta. | Capt. | Walmsley, J. F. S. | Hamilton, Ont. |
| Lieut. | Tucker, G. N. | Saskatchewan. | Capt. | Walters, C. H. A. | Belleville, Ont. |
| Capt. | Tucker, J. B. | St. Raphael de Bell, Que. | Capt. | Walton, C. H. A' C. | Winnipeg, Man. |
| Capt. | Turcotte, M. | Chatham, Ont. | Major | Wansborough, R. M. | Toronto, Ont. |
| Capt. | Turner, W. P. | Barrie, Ont. | Major | Ward, C. V. | Montreal, Que. |
| Lieut. | Tyler, E. R. | Levis, Que. | Capt. | Weinlos, C. W. H. | Edmonton, Alta. |
| Major | Turmel, H. | Preston, Ont. | Major | Weinlos, M. | Edmonton, Alta. |
| Capt. | Urquhart, A. M. | Toronto, Ont. | Capt. | White, A. W. M. | Toronto, Ont. |
| Major | Urquhart, R. W. I. | Toronto, Ont. | Capt. | White, E. P. | Kingston, Ont. |
| Capt. | Vale, B. W. | Toronto, Ont. | Lt.-Col. | Wight, G. E. | Montreal, Que. |
| Major | Van Nostrand, F. H. | Gornby, Ont. | Capt. | Wiglesworth, F. W. | Montreal, Que. |
| Capt. | Van Wyck, N. | Westmount, Que. | Major | Williams, G. S. | Winnipeg, Man. |
| Capt. | Vaisrub, S. | Prince Albert, Sask. | Lt.-Col. | Williams, J. V. | Winnipeg, Man. |
| Capt. | Valeriote, S. L. | London, Ont. | Capt. | Willis, E. A. | Seeley's Bay, Ont. |
| Capt. | Vallee, A. | Quebec, Que. | Lieut. | Wilson, D. C. | Toronto, Ont. |
| Lieut. | Vallee, J. L. J. | Quebec, Que. | Capt. | Winfield, G. A. | Halifax, N.S. |
| | St. A. R. | Consecon, Ont. | Capt. | Wood, C. G. | Ottawa, Ont. |
| Major | Vanluven, O. | Toronto, Ont. | Lieut. | White, J. B. | Atlanta, Ga., U.S.A. |
| Capt. | Van Vliet, W. B. | Toronto, Ont. | Capt. | Wright, J. A. | Vancouver, B.C. |
| Capt. | Vining, J. A. | Toronto, Ont. | Lieut. | Wallace, J. D. | Ottawa, Ont. |
| Capt. | Wales, W. F. | Toronto, Ont. | Capt. | Young, D. A. | Hamilton, Ont. |
| Capt. | Walker, J. E. | Vancouver, B.C. | Major | Young, E. J. | Kingston, Ont. |
| Capt. | Walker, W. R. | Penticton, B.C. | Capt. | Yaffe, S. A. | Moose Jaw, Sask. |
| Capt. | Wallace, S. A. | Kamloops, B.C. | Capt. | Young, B. H. | Pictou, N.S. |
| Lieut. | Wallace, W. M. | Massey, Ont. | Col. | Young, H. G. | Moose Jaw, Sask. |
| Lieut. | Walsh, A. C. | Saskatoon, Sask. | Capt. | Young, J. A. F. | Peterborough, Ont. |
| Major | Walsh, F. E. | Springhill, N.S. | Lieut. | Young, S. | Kitchener, Ont. |
| Lt.-Col. | Walter, A. B. | Saint John, N.B. | Capt. | Zacks, L. | St. Catharines, Ont. |
| | | | Major | Zinkann, R. W. J. | |
| | | | Major | Zumstein, G. T. | |